HOME SCIENCE

A Text-book for Girls in High Schools and Training Schools in South India

OFFICE OF THE PRINCIPAL
27
13 SEP 19..
S.V. NAGARAM
RURAL EXTENSION TRAINING CENTRE

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THIS BOOK IS DEDICATED

TO

THE HOME-MAKERS OF INDIA

PRESENT AND FUTURE

'A home wants nothing when it has a good wife.
If such a woman is not found in the house,
Or if she is a woman that uses hard words
The house is like a den where a tiger dwells.'

Avvai (Translation from *Poems by Indian Women*).

'Wherever a true wife comes, home is always round her. The stars only may be over her head; the glow-worm in the night-cold grass may be the only fire at her foot: but home is yet wherever she is; and for a noble woman it stretches far round her, better than ceiled with cedar or painted with vermilion, shedding its quiet light far for those who else were homeless.'

JOHN RUSKIN
In Sesame and Lilies.

PREFACE

This text-book has been compiled from various sources and with the help of many obliging friends, in response to the immediate need for more material in simple form, for the study of Domestic Science. So many other sciences contribute to *Home Science* that any one text-book can cover only a fraction of the subject. This book attempts only four parts of the subject. The important branches of Hygiene, First Aid, Textiles and Clothing, Cookery, Home Furnishing and Decoration are not touched at all, and Sanitation is only partially dealt with. It is hoped that the subjects treated will be helpful. No one could feel more keenly than do the compilers, the inadequacy of any foreigner to deal with the topic of home-making for India. We trust that more and more Indian women will take up the serious study of Home Science and produce books adapted to Indian conditions. In the meanwhile this book attempts to bridge over the time when there is a great dearth of literature suited to the needs of Indian students.

Physicians and other scientists who chance to read these chapters, may find that large subjects are dealt with in a sketchy and somewhat vague manner. Realizing keenly that 'a little knowledge is a dangerous thing', we still feel that Indian women will not learn to trust and co-operate with the doctor until they understand something of the principles which explain the doctor's orders. In the west understanding and co-operation have followed knowledge of facts, and so they will anywhere. On the other hand, teachers who are accustomed to class Domestic Science with 'Moral Instruction' or 'General Knowledge' as worthy

of one period of good advice a week, may think the lessons too difficult. The book is on the same plane of difficulty as the Chemistry, Physiology, Botany and other studies which a girl has in Fifth and Sixth Forms. Unless she can form for this science the same respect which she has for these others, she is not likely to take it seriously. The book can be used for the two-year course required of all High School girls, or as aid to covering the subject-matter outlined in the syllabus for 'C' or Optional Domestic Science, newly issued. When translated into the vernacular, it is hoped that it may be used in Higher Elementary Training Schools in connection with the new syllabus. The lessons here included have all been taught to groups of High School girls, and some have been taught in Training School together with 'Rural Science'.

In the Nutrition section we have not attempted to introduce cooking-lessons, because foods vary so much in different parts of the Presidency. We leave it to the teacher to supplement each chapter of theory with practical work in the preparation of food, using the kitchen as her laboratory. Cookery is a subject which must be worked out by Indians themselves, whereas the general principles of Nutrition are the same the world over. Some suggestions for a cooking-syllabus are given in the new syllabus for 'B' Domestic Science in the Madras School Final course. Somewhat detailed directions are given here in the section on Invalid Diet, for the preparation of foods suitable to invalids and young children, for this is a field where Indians can learn much from the experience of western home-makers.

In the teaching of each section it is urged that the study be supplemented by practical work, so that each principle may actually function in the life of the pupil, and not end

with the printed page. Just as, in the Chemistry class, half the time each week is given to experimental work in the laboratory, so also in the study of Home Science should half the time be spent in the kitchen, the laboratory, the 'sick-room' or school-dispensary (an imitation one is better than none), the 'Baby Welcome' or the poultry-yard. Assignments to be carried out at home in the holidays will link up the Home Science class with the home. 'Learn by doing'.

It now remains to thank the many friends who gave freely of their time and their knowledge to help the enterprise.

We greatly appreciate the courtesy extended by Lieutenant-Colonel McCarrison, Director of Nutritional Research at the Pasteur Institute, Coonoor, who read the manuscript of the first section, and permitted us the extensive use of his charts, tables and pictures, giving the results of his researches. Macmillan and Co., the publishers of his valuable little book, '*Food*', kindly permitted us to reprint his tables of composition of foods, so that they might be easily available to the pupils using this book. In the preparation of the Nutrition section we are also indebted to Miss Joy Solomon, M.A., L.T., for the practical lessons on Rice, Oil and Jaggery, which she worked out with her own classes, at Sarah Tucker High School, Palamcottah.

For the Child Welfare section, part of the material was supplied by Miss Anna Degenring, M.D., the specialist in Children's Diseases at the Vellore hospitals and Medical School, and the rest by Mrs. A. R. W. Korteling, M.D., of the Women's Hospital at Madanapalle.

In the preparation of the third section we are much indebted to Miss Noordyk, R. N., Nursing Superintendent of the Scudder Memorial Hospital, Ranipettai, for her notes on Home Nursing (already used with several groups of High

School 'home-nurses') and to Dr. Korteling who read and corrected the entire manuscript of this section, as of the previous one.

The chapter on 'Supplementing the Family Income' in the Home Economics section was written by Mr. J. J. De-Valois of the Agricultural Institute, Katpadi, whereas the facts and figures for the budgets and accounts in that section were supplied by Indian friends.

Thanks are also due to Rev. M. A. deWolf of Chittoor for his photographs and sketches. Many others have helped by translation or advice to prepare the manuscript, and to these all we give our grateful *namaskarams.* Some credit should also go to our American forerunner, Willard and Gillett's *Dietetics for High Schools* for the idea of centering the study about a family.

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PART I

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'Back of the loaf is the snowy flour,
And back of the flour the mill
Back of the mill is the wheat, and the shower,
And the sun, and the Father's will.'

Babcock.

A worthy woman who can find?
For her price is far above rubies.
The heart of her husband trusteth in her,
And he shall have no lack of gain.
She doeth him good and not evil all the days of her life.
She seeketh wool and flax and worketh willingly with her hands.
She riseth also while it is yet night,
And giveth food to her household.
She considereth a field and buyeth it;
With the fruit of her hands she planteth a vineyard.
She layeth her hands to the distaff and her hands hold the spindle.
She stretcheth out her hands to the poor,
Yea she reacheth forth her hands to the needy.
Strength and dignity are her clothing
And she laugheth at the time to come.
She openeth her mouth with wisdom
And in her tongue is the law of kindness.
She looketh well to the ways of her household
And eateth not the bread of idleness.
Her children rise up and call her blessed;
Her husband also, and he praiseth her saying,
Many daughters have done worthily but thou excellest them all.
Grace is deceitful and beauty is vain:
But a woman that feareth the Lord, she shall be praised.

The Bible (*Proverbs xxxi*)

CHAPTER I

FEEDING THE RANGANATHAN FAMILY

Mr. Ranganathan was a clerk who lived with his wife and five children on the main street of a fairly large town. Their oldest daughter, Padma, was married and lived in another town about fifty miles away. The eldest son, Narayanan, though only fifteen, was in the Fifth Form and very ambitious to get on into college and engineering college. Kamala, aged thirteen, was in the Third Form, which was the highest class of the local girls' school. She loved to study and was very anxious to go to boarding-school in the city the following year to finish her High School course. She even dreamed of college, but it was a matter of debate between Mr. and Mrs. Ranganathan and their relatives whether to let her go on, or stop her at home until she was married. She was very thin and had frequent attacks of fever, so that many thought she should not try to study further. Sundaresan, a fat little boy of twelve, seemed to have no ambition to study, and was only in First Form despite much nagging from his family. The little nine-year-old girl, Sita, was only a year behind him. Since two babies after Sita had died, the whole family was particularly devoted to the youngest, a baby-boy of fifteen months who was well named Rajan, for his parents and brothers and sisters were his devoted slaves. Mrs. Ranganathan, like many other mothers, found it a hard and perplexing task to feed this large family with only a small servant-girl in the kitchen to help her. Both she and her husband were constantly worried about money. His salary was only sixty rupees a month, and they could not seem to keep their

expenditures within that amount, moreover they had incurred heavy debts at the time of Padma's wedding a year before. The boys had tuition every afternoon, and Kamala had music-lessons both on the violin and harmonium, which were heavy but apparently necessary expenses. They all needed good food and that too was expensive.

Mr. Ranganathan's office and the children's schools opened at ten o'clock, and they had an hour's interval from one to two at noon. The boys were near enough to come home but the girls and their father were too far and had to carry a tiffin with them. Mrs. Ranganathan was up before dawn, like all good housewives, and had coffee ready for all of them to drink when they wanted it. There were generally *palagarams* or *appams* to eat with the coffee if they wished. In fact Mrs. Ranganathan spent a good share of every day sitting over the fire frying *pusthole* or *palagarams* or *vadais*, for the children were always demanding them. The rice and curry had to be ready by nine o'clock in the morning. Kamala helped her mother to prepare it while Sita carried the baby. Both Mrs. Ranganathan and Kamala were too hot and tired to eat very much themselves by the time they had fed the rest. Narayanan refused to leave his books until his mother insisted, and then ate very little. His mother tried to tempt his appetite with hot chutneys and different kinds of curries. Sundaresan, on the other hand, was her especial delight for he ate enormous quantities of anything she prepared, and was always ready for more. He was eating something nearly all the time he was in the house, as was little Sita. Sita only picked at her food, but was very fond of sweets and dried peas and puffed rice and other things to eat. She sat on her father's knee and coaxed him to give her a quarter-anna or an anna and then ran out to the bazaar to get *gelabi* or *murukku* or *omapodi* which she would share with no one but Baby

Rajan. She and Kamala rode a mile to their school in a bullock-cart after Kamala had drunk her coffee. Kamala really cared for nothing much but coffee in the morning or at any other time. She hated vegetables and would eat only certain kinds of very hot curry or chutney with her rice. Her mother filled a tiffin-carrier with rice and curds for her husband's tiffin, but the girls preferred *palagarams*, wrapped in a plantain leaf, and a large brass screw-top *cooja* of coffee.

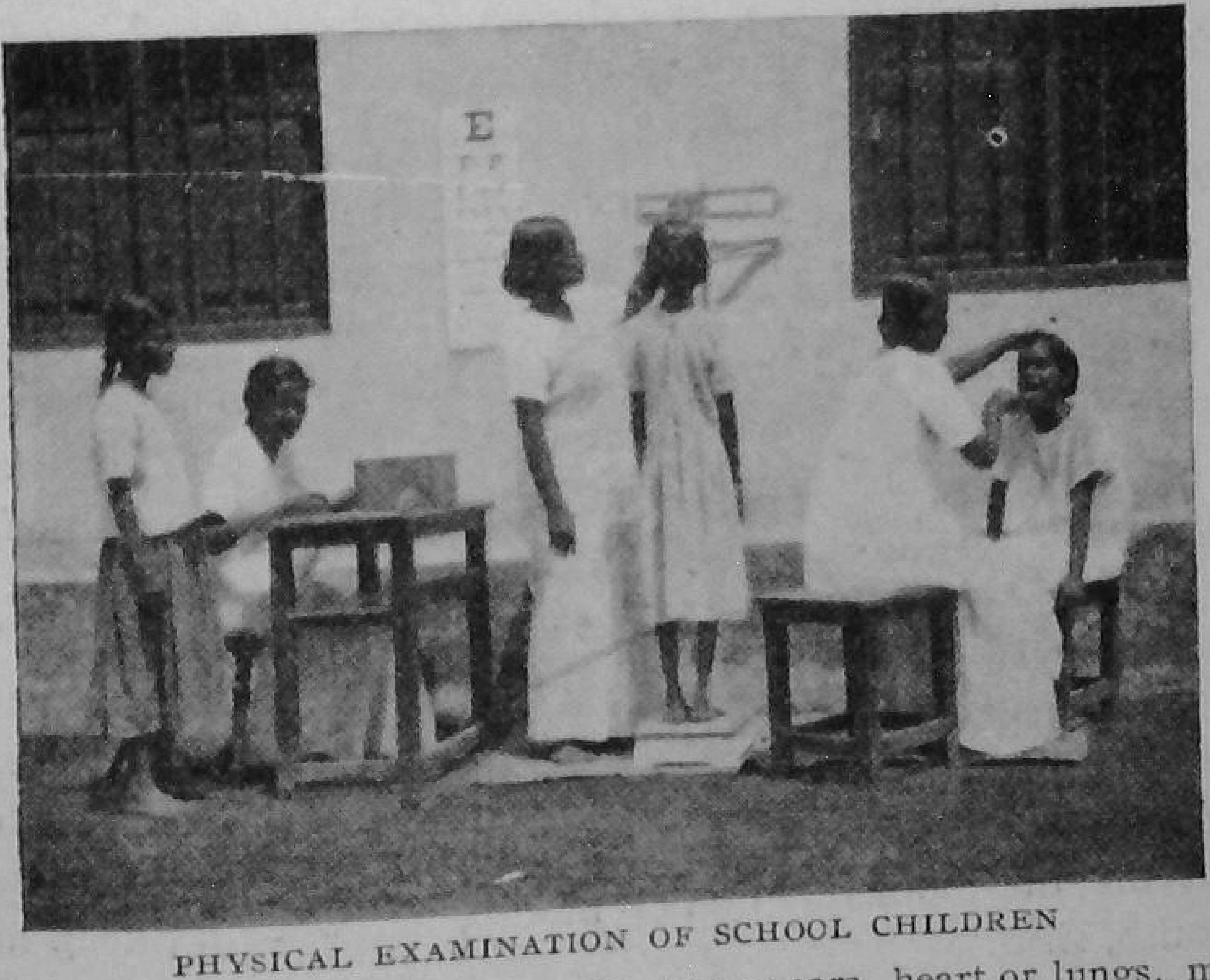
When the boys returned at noon, Sundaresan ate more rice and curry and wanted plenty of ghee. Narayanan sometimes failed to appear if he stayed at the school to study, but in that case his mother sent him something to eat. She bought two ollocks of milk a day for Baby Rajan, but he was growing less and less inclined to drink it. Sometimes she struggled half an hour with him but he made such a fuss that she finally let him have some of her own coffee, or even put him to her breast to quiet him when he cried. Now that he could walk he was never still for a minute and either she or the servant-girl or one of the sisters had to carry or follow him all the time. He was thinner than he had been as a little baby and slept only in snatches at night, waking up frequently to cry. Unless someone walked about with him or swung him violently in the basket he would not go to sleep again. Sometimes he fell asleep on the floor in the day-time while he was playing. He was a very bright baby, delighting the family with his amusing tricks and attempts to talk. They loved to let him take up rice and curry just to see how cleverly he got it in his mouth, and to see him gasp when he got a hot chiili. The children were always feeding him pieces of their sweetmeats and *palagarams*. Both he and Sita had stomach-ache so often that their mother gave them a little castor-oil every day. The older children generally had castor-oil on alternate Saturdays or Sundays.

Soon after four o'clock on school-days, Mr. Ranganathan and the children returned from school. Kamala's music teacher kept her busy for an hour, after which she either helped her mother or prepared her lessons. Sita joined in music lesson as much as the restless baby would allow, but generally she had to carry him out into the street to amuse him. The boys' tutor came at five and kept them at work till nearly seven, after which the older one was too tired to do more than lie about. Sundaresan had a secret desire to play football with some of his friends on the *maidan* but they laughed at him because he was fat and short of breath, so he gradually got into the habit of wandering up and down the bazaars instead, sometimes joining with others to play tricks on the shop-keepers or on ignorant and stupid purchasers. At about eight or sometimes more nearly nine, the family had their heaviest meal of the day, little Sita and the baby generally being awakened for their share. Narayanan and Kamala studied until ten or eleven by the light of a hurricane lantern unless Narayanan had one of his vomiting spells. Kamala liked to drink a little coffee every once in a while to keep herself awake. The rest of the family fell asleep earlier, but Mrs. Ranganathan was up several times in the night with the crying baby.

CHAPTER II

THE CHILDREN HAVE A PHYSICAL EXAMINATION

Things were going on like this when, all in the same week, the children came home from school with letters from a doctor who had given them all a physical examination. Their mother did not understand why any doctor should interfere with her children without their father's permission. Wasn't it enough that they should be forever 'pricking' them with needles to avoid small-pox, plague or cholera? What was this new business of a doctor?



PHYSICAL EXAMINATION OF SCHOOL CHILDREN

Faulty conditions of teeth or tonsils, eyes or ears, heart or lungs, may hinder normal growth and development.

Her husband explained that this was also by rule of the *Sircar*, that every school-child should be examined in school hereafter. He opened the four slips of paper and stared at them a long time. They read something as follows :

R. NARAYANAN : Advise refraction. General debility. Lungs weak. Needs rest and good nourishment, and medical care.

R. SUNDARESAN : Twenty pounds over normal weight for his age and height. Must reduce weight. Under-nourished. Advise strict diet and regular exercise.

R. KAMALA : Anæmic and under-nourished. Ten pounds under-weight. Weak heart. Advise more complete examination, medical treatment and nourishing food.

R. SITA : Marked malnutrition. Advise tonsillectomy and examination for ankylostomiasis. Needs medical care and careful diet.

With a little help from the dictionary, Mr. Ranganathan understood part of these amazing statements.

'The doctor says that none of them get enough to eat,' he explained.

'Enough to eat!' exclaimed Mrs. Ranganathan, who had spent nearly eight hours that day in the smoky kitchen. This was adding insult to injury. She wept loudly and reviled the doctor.

'What are "anky-los-to-mi-a-sis" and "tonsil-lect-o-my"' spelled out Sundaresan. 'What did she say to you, Sita?'

'We had a woman doctor,' interrupted Kamala. 'I was there when Sita was done and Sita's teacher told the doctor that Sita was always sniffing and coughing. And when they put the thermometer in her mouth, she wouldn't keep her mouth, shut.'

'I couldn't breathe!' retorted Sita.

'And the doctor said she had flesh growing in her nose,' Kamala finished.

'What's refraction?' demanded Narayanan. 'He made me read letters across the room, and listened to my chest a long time.'

They puzzled over the reports for some time. At last Mr. Ranganathan went for help to a woman-doctor, with whom they were acquainted. He returned to her office on the following Saturday with the four children, and waited till she examined them one after another, and took specimens for microscopic examination. She asked many, many questions about their food, their day's programme, their previous illnesses, and other matters, and wrote down notes on a paper. Then she asked Mr. Ranganathan to come back with his wife three days later.

SOURCE BOOK

Richardson's *Rebuilding the Child*—G. P. Putnam's Sons—N. Y. and London. Pp. 13-53.

CHAPTER III

ADVICE FROM TWO FRIENDS

They were at the office at the appointed time. The Doctor-Friend brought with her a young woman, called Miss Arokiam, who had gone abroad for special training, whom she called 'the dietitian' of the hospital. First the doctor talked to them for a long time. What she said was something like this:

'It is true, as the school doctors have said, that all four of your children are under-nourished. Now don't feel hurt, Amma. I know how hard you work to cook for them, and I don't doubt that you give them plenty of food, perhaps too much food. The trouble is not that you do not feed them. The trouble is that you, like so many mothers in this town, do not understand how their bodies are made and what they need. Now your husband, I understand, is a clerk, and he has to use a typewriter. In order to make the typewriter do good work, he has to understand all its parts, and he has to know what oil to use and what to do to keep the machine in good condition. You see my motor-car outside there? My driver has to know all about that to make it run well. We have to feed it with the right amount of petrol and the right amount of oil to make it work for us. If we poured in castor-oil, would it go? No. Castor-oil is good for lamps and for medicine, but it is bad for motors. Our body is a machine. It works more than the motor for it works all the time. Even when we lie down to sleep at night, our hearts are beating and our lungs are breathing in air and our food is being digested. We must understand this machine and give

it just the right things to build it and repair it and make it work properly, otherwise something will go wrong.

'Your children's bodies are like machines, and you need to understand just what sort of food to give them to keep them well and to help them to grow. It is not that they need a large quantity of food. If you give them what their bodies need you can give them less, and you need not spend so much money or so much effort either. This friend here has studied all about food and she will help you to plan your meals to suit the needs of your family, if you wish. But first I want to tell you what I have found out about their present state of health. The hospital is the repair-shop for bodies that are out of order and the doctor can help to put matters right.

'First the oldest boy, Narayanan. He has been developing his mind at the expense of his body. He has almost no exercise, and not enough sleep. He has injured his eyes by too much reading in dim light. He has not had enough fresh air to conquer the germs of coughs and colds and there is great danger that he will develop tuberculosis. My advice is that you stop him from school at once and make him rest for the remainder of the year. Let him forget his lessons, and give both his eyes and his mind a vacation. He must sleep on the verandah at night and rest there six hours a day, taking a short walk or working in the garden morning and evening. After three months let him come to me to see whether he needs glasses. I think that a change of food and a complete rest will accomplish more than glasses.'

'But he cannot stop school!' stammered the father. 'I have paid his fees to the end of the term, and anyway he will lose a whole year. I need his help in supporting the family as soon as possible.'

'If you keep on pushing him like this, you will not have a son very long', replied the doctor sternly. 'What good

will his education be to him if he loses his health ? Let me finish my advice for I have a lot of patients waiting to see me.

'The other boy, Sundaresan, is eating far too much food. He is over-working his organs. His body cannot take care of so much, so he loses the good of it. Moreover, he is being starved in certain elements which he needs. The dietitian will explain that. My advice for him is that you cut down his diet as she advises, and that you make him play football. Why isn't he a Boy Scout ? He is as fat and lazy as a jelly-fish. Make him lose ten or twenty pounds of weight and harden his muscles with exercise. Then you will see how he improves in his studies. An afternoon of football will do more than a dozen tutors if his brain is not befogged with over-eating.

'Then the girl, Kamala. Her heart is weak but that is something which she will outgrow. She is growing fast and she is working her body too hard with too little nourishment. She might just as well try to run a motor without petrol. She must get ten hours of sleep at night, outdoor exercise and plenty of milk and nourishing food. And she must absolutely stop drinking coffee. It is doing her harm.'

'But she won't drink milk,' interrupted Mrs. Ranganathan. 'None of my children will drink milk, no matter what I say.'

'Miss Arokiam, the dietitian, will advise you about that. Another trouble with Kamala is that her blood is full of malaria-parasites, and the result is that she is very anæmic. See ! Her blood should be bright red like this . . .' She showed them a chart, 'and instead it is pale like this. We must kill the malaria germs which give her fever and then help her body to build good red blood. She had low fever when I examined her, and doubtless has it now. Please leave her here in the hospital for a week so that I can give her the treatment she needs.'

'And the little girl?' asked Mr. Ranganathan apprehensively, remembering the long, long words on the report.

'She had better come along to the hospital with her sister. Until one or two repairs are made she cannot get the good out of any food she eats. There are thousands of hookworms in her intestines sucking her blood and draining the life from her. That is what is meant by ankylostomiasis. One or two doses of medicine ought to put that right. Then the poor child is being starved for air because her nose is blocked with adenoid growths, and her throat is blocked by tonsils. The tonsils would do no harm if they were not enlarged so that they hinder her breathing. They also have pus-pockets in them which will poison her body if they are left. Does she sleep well at night?'

'Oh no', replied the mother. 'She keeps me awake by snoring, and often gets up and walks around in the night. She always has colds and coughs.'

'Let me take out the tonsils and adenoids and she will feel much better. And now I will leave you to Miss Arokiam, for I must go. If you decide to follow my advice, I will expect Kamala and Sita to come in as in-patients to-morrow.'

The Doctor-Friend hurried away to the dispensary. Mr. and Mrs. Ranganathan looked at each other in some bewilderment. It was not as bad as they had feared, but it was bad enough.

Mrs. Ranganathan turned to Miss Arokiam.

'Tell me, what does the doctor mean when she says that our children do not get enough food? My husband gets a salary of only sixty rupees. I think we spend more than half of it in food. I give them plenty. It is true, they won't always eat, but is that my fault? If they were hungry that would show that they needed more, but they always say they

are not hungry. Three she blames for not eating enough and the fourth, who eats properly, she says must be starved.'

'You see those men building a house out there,' explained Miss Arokiam, pointing through the window to where they were building a new wing of the hospital. 'They need bricks chunam, stones, sand and later doors, windows, furniture. When the people live in the house they must have firewood for the hearth and oil for the lamps. So many, many different things are needed for a house. In the same way our body needs many different kinds of foods. Some are for building the bones and muscles and organs, some for fuel to give heat and energy. Now suppose the coolies brought nothing but bandy-loads and bandy-loads of firewood? That would be more than was needed for fuel. It would simply fill up the storeroom and lie about the compound hindering the builders. The builders would have to stop work and say, 'Bring us more chunam! Bring us more tiles! We cannot build.' Or suppose all the materials were there, and there were no carpenters or masons to put them together? It is only when all the builders are there and the right materials, that the house can be built and furnished and used.'

We cannot report the whole conversation between Miss Arokiam and the Ranganathans. Suffice it to say that they became very much interested in what she had to tell them and wanted to learn more. Mr. Ranganathan borrowed an English book on Dietetics, and his wife promised to attend a Mothers' Club to be held every Friday afternoon at Kamala's school, where Miss Arokiam was to begin a course of lectures on Food. When they went home and told the children of their interviews there was much consternation and rebellion, but Mr. Ranganathan was firm.

'I don't have to go to the hospital for a week to learn all that', protested Kamala, weeping. 'We are beginning to

learn Dietetics in Domestic Science. I don't care what the books say—I won't drink milk!'

Nevertheless, the doctor's advice was put into effect. Narayanan lay on the inner verandah instead of going to school. Kamala and Sita went off to the hospital, where their one week lengthened into two. Sundaresan joined the Boy Scouts at his father's stern command, but when his mother refused him *palagarams* he got money from his father on false pretences and bought them secretly in the bazaar. After Mrs. Ranganathan began to attend the Mothers' Club, and Kamala returned to her Domestic Science classes, there was a great deal of talk in the family about this new science. The following chapters will give you a summary of what Kamala and her mother learned about Nutrition. You will find it interesting to study with them.

CHAPTER IV

PROTEINS

1. Composition

The proteins in different foodstuffs all differ from one another to some degree, but they all contain the following elements: carbon, hydrogen, nitrogen, oxygen and sulphur. In the stomach and intestines proteins are acted upon by various digestive juices (enzymes) and changed into simple acids called *amino-acids* which are absorbed into the blood and carried to the tissues.

2. Function

Protein has two important uses :

a. It builds the muscles and glands of the body.

What work do our muscles do ?
What important glands of our body can you mention ?
Could we live without muscles and glands ?
At what time of our lives does the building-process go on ?

It appears, therefore, that the most important time of our lives for eating proteins is in babyhood, childhood and youth while our bodies are being formed. In old age we do not need such a large quantity. At all times, however, we need protein to fulfil its second important function.

b. It repairs the worn-out muscles and glands.

What work do your arm-muscles do ?
What work do your heart-muscles do ?
What work do your kidneys and liver do ?
What happens to a bicycle when you use it everyday for a long time ?
What happens to the tyres of a motor car ?

We send the bicycle and the motor-car to the repair-shop to have their tyres and other parts renewed, but our body repairs itself. While we are resting from activity or sleeping at night, the protein rebuilds and renews the worn-out cells of our muscles and glands, without any trouble to us.

3. Kinds of Protein

In general there are two kinds of proteins—animal-proteins and vegetable-proteins.

a. Animal Proteins include the proteins found in fish, milk, milk-products, and the muscles and glands of animals. These exist in the following quantities :

FOOD		PROTEIN	FOOD		PROTEIN
Chicken meat	...	20 per cent	Egg	...	13 per cent
Chicken heart	...	21 ,,	Milk	...	3 ,,
Chicken liver	...	22 ,,			
Chicken gizzard	...	25 ,,			
Mutton	...	18 ,,			
Liver	...	20 ,,			

b. Vegetable Proteins. The leguminous plants have the ability to take nitrogen from the air and store it, forming protein. Leguminous plants include the plants of the pea-family,—beans, peas, *dals* and grams, also ground-nuts.

Grains and other seeds also include a small percentage of protein.

Following is a list showing the proteins contained in the different legumes and seeds :

FOOD	PROTEIN	FOOD	PROTEIN
Soy beans ...	38 per cent	Mustard ...	18 per cent
Ground-nuts ...	29 ,,	Cocoa bean ...	21 ,,
Dal ...	25 ,,	Wheat ...	11 ,,
String-beans ...	26 ,,	Thenai ...	11 ,,
Peas ...	24 ,,	Ragi ...	10 ,,
Bengal gram ...	17 ,,	Kambu ...	10 ,,
Black gram ...	18 ,,	Varagu ...	10 ,,
		Cholam ...	9 ,,
		Maize ...	7 ,,
		Rice ...	6 ,,

4. The Daily Requirement of Protein

Little babies, who are growing very fast, need one and a half grammes of protein for each pound of body weight, whereas adults, whose growth has stopped, need half a gramme daily, for each pound of body weight. Growing children need to have an amount somewhere between these two extremes.

Considering your age and weight, how many grammes of protein do you think you need in a day ?

It is of no use to eat more than the necessary amount of protein. Any extra protein is burned by the body as a fuel food. Protein foods are too expensive to use for fuel. When we want to build a fire we do not take the doors and windows of our house for firewood. We burn cheap wood for fuel, but use more expensive wood for building the parts of our house. In the same way, we should use the cheaper carbohydrate food for fuel and eat only the amount of protein required for building our muscles and glands and keeping them in repair.

At the same time, it is very necessary that we get enough

protein every day to supply the needs of the body. No other food-element can supply the lack, if we eat too little protein. Children who have too little protein do not have normal growth of either body or mind. It is imperative that you find out wether you and the members of your family are getting the protein you need.

5. How to find out whether you get enough protein in a day

Measure out the amount of rice, dal, beans, meat and other protein foods (uncooked) that you eat in a day. Weigh each separately in a chemical balance to find the total number of grammes of each. For example, you may find that an ollock of rice weighs 185 grammes. From the above table you know that 6 per cent of the total quantity of rice will be protein grammes so you know that an ollock of rice will give you 6 per cent of 185 grammes or 11·1 grammes. As you proceed, fill out a table like the following.

HOW MANY PROTEIN GRAMMES I EAT IN A DAY

Morning Meal		Noon Meal		Night Meal	
	Prot. Grams		Prot. Grams		Prot. Grams
½ Ol. ragi, or wheat	——	1¼ Ol. rice.	——	1 Ol. rice.	——
1 Chittack milk	——	1 Chit. dal.	——	Mutton.	——
½ Chit. Jaggery	——	3 Brinjals.	——	½ Chit. dal.	——
Total	——	Total	——	Total	——

My requirement of Protein Grammes for a day is . . . . Grammes.
Total number of Protein Grammes I eat in a day is . . . . Grammes.
Balance ——

When you fill out the above table you will know whether you are eating enough protein food to build your muscles and glands. Remember that growing boys and girls need more protein food than adults. If you are not getting enough, plan how you can add more protein to your daily diet.

6. Vegetarian Diet

Many people in India consider it a sin to eat meat, and many others do not like meat even though they see no harm in it. Some say that eating meat makes people fierce and warlike, but when we study the races of mankind we see that this is not so. The Eskimos of the North are a gentle, happy people, although they live on meat entirely.

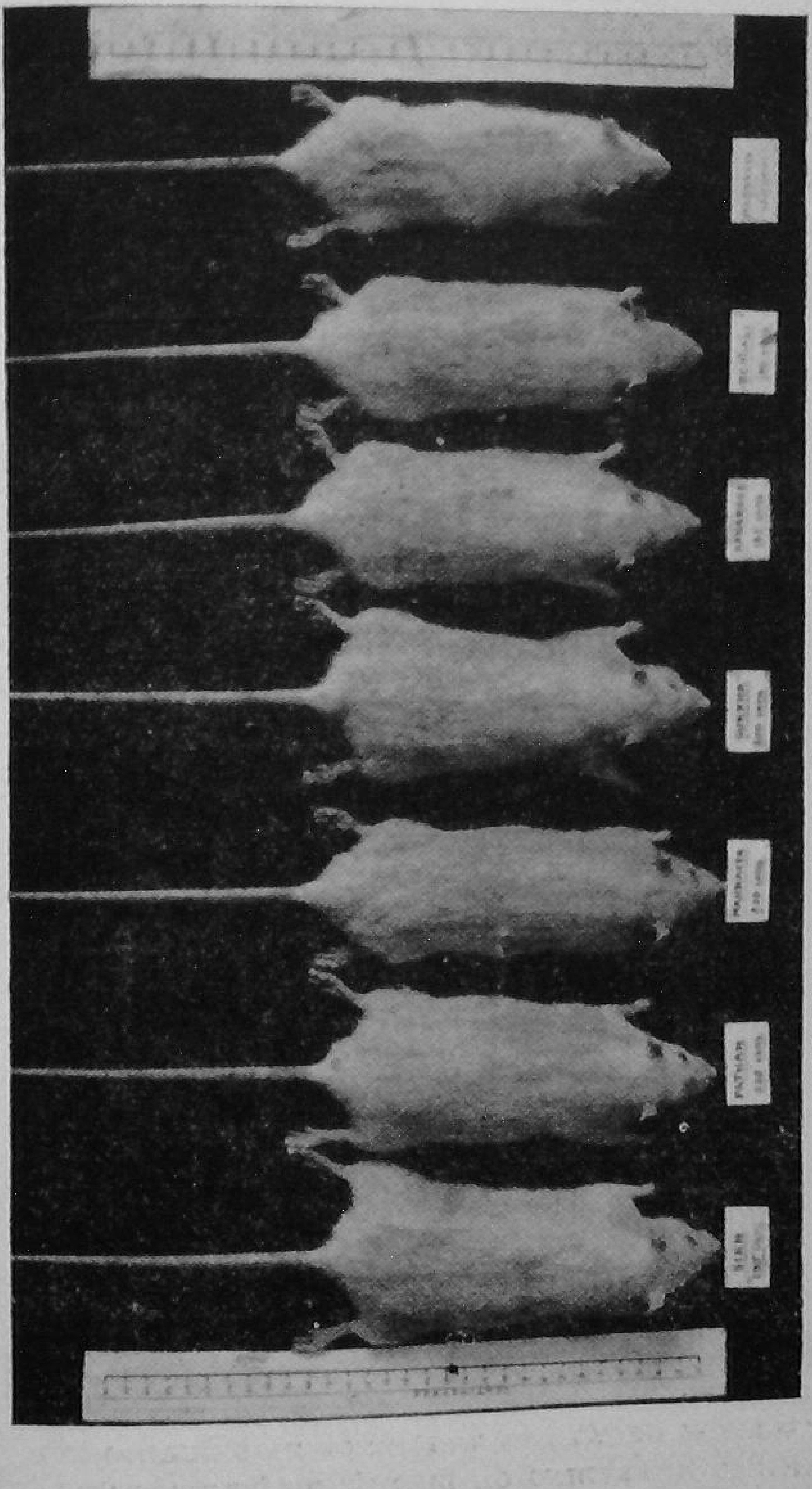
Those who do not include meat, fish or eggs in their diet lose a large amount of protein which they should make up in other ways. They should be careful to eat enough of the legumes and grains to provide them with the protein needed to build their bodies. Scientists have proved by experimentation that animal proteins contain more nitrogen and are more essential to growth than vegetable proteins. There are also certain mineral elements lacking in the legumes and grains. The bones, muscles and glands will not develop as they should in a person who lives on a diet of grains and legumes only. Vegetarians must take a great deal of milk, curds and ghee to supply animal proteins, and green, leafy vegetables to supply the missing mineral elements. If they are careful to do this, they can get on without meat or fish.

PROBLEM: *Plan a week's vegetarian diet for yourself.*

7. The Diet of Different Races in India

Dr. McCay and Dr. McCarrison, scientists who have studied the different races of India and their various diets, tell us some interesting facts about the effect of diet upon the strength and health of all races. Study the table of diets. (See Appendix.)

The strongest people in India are to be found among certain Himalayan hill-tribes and the fighting-races of India,—Pathans, Sikhs, Panjabis, Dogras, Rajputs and North Indian

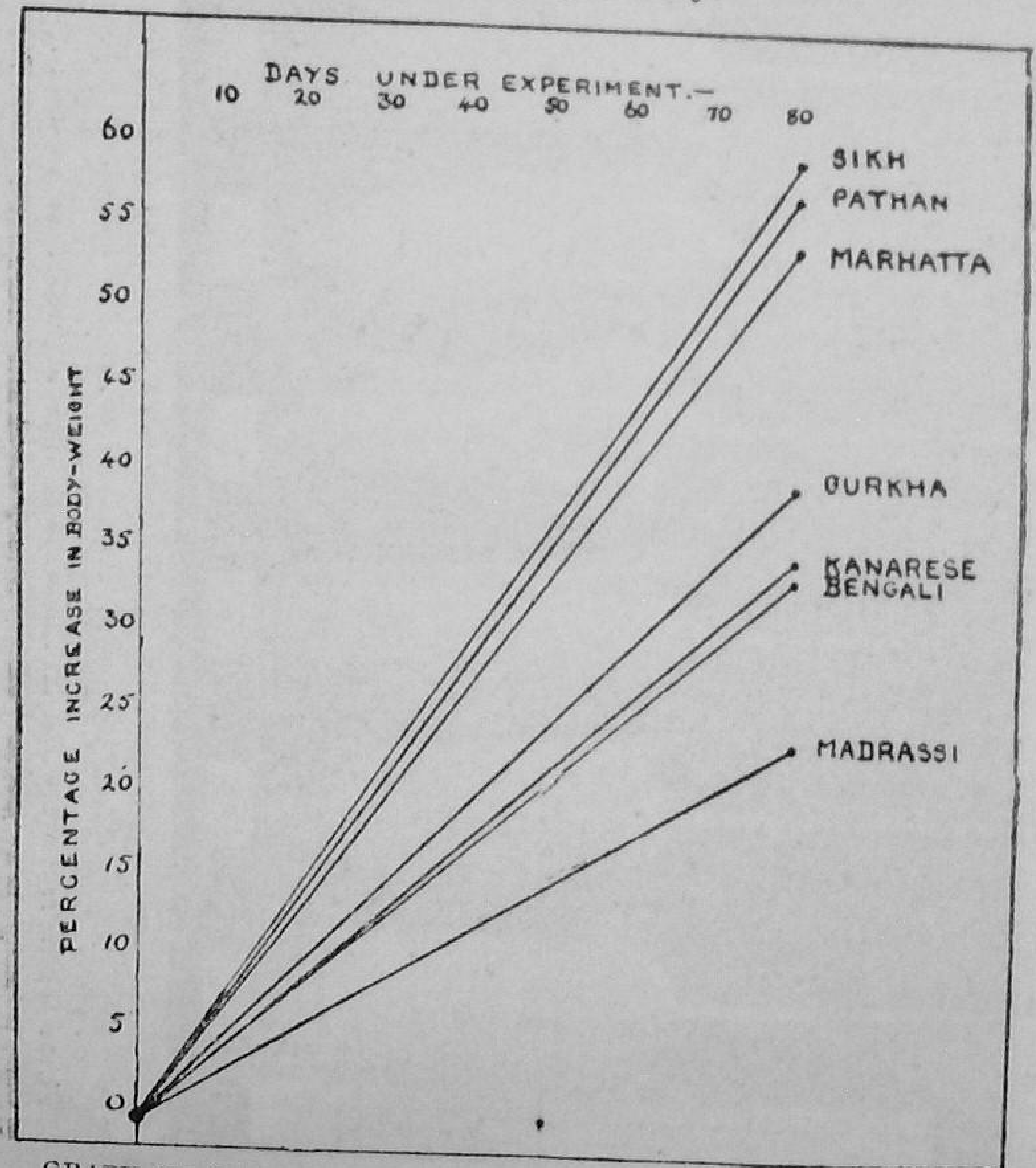


EXPERIMENT TO PROVE EFFECT OF DIET ON RACES

(*By Courtesy of Dr. McCarrison*)

These white rats were fed on the diets of the various races of India. Their weights at the close of the experiment are here listed. Note that the rat fed on Madrassi diet is the smallest.

Brahmins. These men and women are tall, strong and active. They rarely suffer from intestinal diseases. Many of them go as soldiers and policemen to other parts of the British Empire. Compared with these races, the people of lower Bengal and the Madras Presidency are small and poorly developed. They suffer a great deal from intestinal diseases such as diarrhœa and dysentery.



GRAPH TO SHOW GROWTH IN WEIGHT OF RATS DURING THE EXPERIMENT IN FEEDING ON DIET OF DIFFERENT RACES

(By Courtesy of Dr. McCarrison)

What makes the difference?

The Sikhs eat whole-wheat *chapatties*, legumes and tubers, green vegetables and ghee, and occasionally meat. They drink large quantities of cows', goats', and buffaloes' milk from babyhood up. The Pathans eat more of meat and less of legumes than the Sikhs, also more fruit and nuts. The people of Hunza in the Himalayas 'are unsurpassed by any Indian race in perfection of physique; they are long-lived, vigorous in youth and age, capable of great endurance and enjoy a remarkable freedom from disease in general'. The diet of these people consists of less meat and less milk than the Pathans and Sikhs, but a greater quantity of fruit. Their chief article of food is a kind of cake made of dried mulberries mixed with whole-wheat flour.

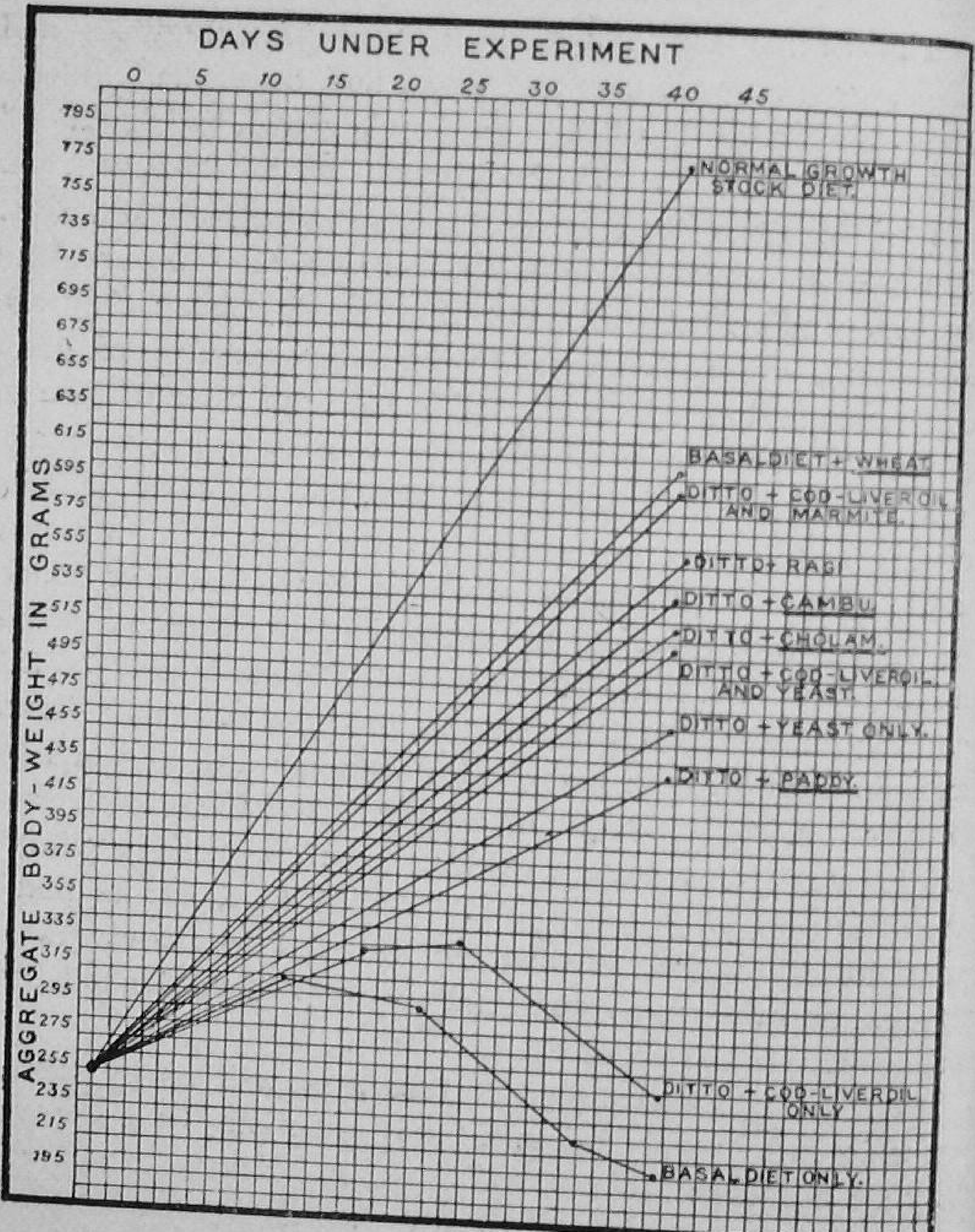
When we turn to the physically inferior people of Bengal and Madras, we find that their diet consists largely of rice and legumes. This is a diet that provides too much starch and too little protein and certain vitamins and minerals for proper growth. Some may contend that the Pathans and Himalayan tribes have a colder, more invigorating climate than the people of the South. This is true, but we find a marked difference between the rice and legume-eaters of Bengal and the wheat and legume-eaters of the United Provinces where the climate is the same.

By such observations as these, as well as by careful experiments upon animals, the scientists have proved beyond a doubt:

(1) the superiority of wheat to rice as a main article of diet;

(2) the superiority of animal proteins to vegetable proteins;

(3) the importance of vitamins and mineral-elements (to be studied later).



GRAPH OF ANOTHER EXPERIMENT IN FEEDING RATS ON DIFFERENT GRAINS

(By Courtesy of Dr. McCarrison

QUESTIONS

1. Make a list of animal proteins and the vegetable proteins in the diet of the Sikhs and Pathans. Compare them with the proteins of your own diet.

2. What changes should the people of the Madras Presidency make in their diet, in order to become strong and healthy like the Northern races?

3. What other grains beside wheat, contain more protein than rice?

4. How can you change the diet of your school or of your home to increase the amount of protein?

5. Why do people recovering from long illnesses need to eat eggs and drink milk?

6. Make a list of the proteins which the Ranganathan family ate. Did any of them get enough of this element?

SOURCE BOOKS USED IN COMPILING THE MATERIAL FOR THIS CHAPTER

The Newer Knowledge of Nutrition by E. V. McCollum, Chapters iv, v, vi, vii.

Articles by McCarrison in the *Indian Medical Journal*.

McNally's *Sanitary Handbook for India*. Chapter and tables on Diet.

CHAPTER V

MINERALS OR ASH-CONSTITUENTS

Look at the table (see Appendix) showing the elements which make up our bodies. How many minerals are in the list? Have you seen or handled any of these minerals? What do you know about any of them, or any of the compounds formed from them?

If an animal body is burned, or if any food-stuff is burned, these minerals will be left in the ashes. Their form may be changed but they will not be consumed. For this reason the mineral elements are sometimes called 'ash-constituents'.

Function of Minerals in General

There are three ways in which the ash-constituents take part in the functions of the body:

1. They give hardness and rigidity to our bones and teeth.
2. They form an important part of the soft tissues (muscles, blood-cells, etc.).
3. They are found in solution, in the various *fluids* of the body, where they affect the muscles and nerves and also the digestive juices and other secretions of the body.

In order to understand their functions in detail we should need to study a great deal of Organic Chemistry, but the above outline serves to show us how important the mineral elements of our body are as *body-building materials*, as well as in other ways. We shall now take up, one by one, a few of the important minerals.

(A) Calcium

1. FUNCTION: One form of calcium with which we are familiar is common chalk. Another is lime or *chunam* which is used in building houses, also the *chunam* that is chewed along with *pan-supari*. Another form of calcium forms an important constituent of our bodies. 99 per cent of it is in the bone and teeth while 1 per cent is a very important part of the soft tissues and the body-fluids, such as blood. The calcium salts in the blood are absolutely necessary to the beating of the heart. From what you know of the properties of calcium, what would you think would be the function of the calcium in the bones and teeth?

2. SOURCES: Flesh-eating animals get their calcium-supply by gnawing the bones of other animals. For us the chief source is milk. At what period of our lives do we drink the most milk? Why? Other foods which give us less quantities of calcium are beans, butter-milk, *dal*, wheat, egg-yolk, cocoa, onions, cauliflowers, greens, radishes, brinjals, oranges, figs, potatoes, tomatoes, and some other vegetables. Another source for a small amount of calcium is water, especially if the water be 'hard'.

3. REQUIREMENT: An adult needs 0·0045 gramme of calcium per day for each pound of body-weight. From the table (see Appendix VI) you can work out what foods will bring you this quantity. Mothers and babies and growing children need even more.

Since calcium is an important body-builder, it is necessary for the baby. Both before and after the birth of her child the mother needs to eat foods which contain calcium. If she does not get enough of a supply for her own and her baby's needs, her own bones and teeth may be weakened by having the calcium withdrawn for the urgent needs of the baby's body, or her child may go through life suffering from poor teeth, or

deformed because of bones that are too easily bent, because there was not enough calcium to build them strongly. Both during pregnancy and the time when she is giving milk, the mother must plan her diet to include plenty of milk and other foods rich in calcium. After birth the baby lives on milk for nearly a year. When weaned also, the child needs a great deal of calcium all through the period of growth.

(B) **Phosphorus**

1. FUNCTION: Phosphorus is another important body-builder, for it is not only part of the bones and teeth, but it is a part of the nucleus of every cell in the body. It affects both the digestive and nervous systems, and is necessary to growth.

2. SOURCES: The foods which give us phosphorus are milk, butter-milk, fish, cocoa, eggs, greens, pumpkin, lettuce, celery, cauliflower, cucumbers, green peppers, beans, *dal*, brinjals, peas, tomatoes, corn, carrots. Other vegetables, as cabbage, potatoes, and radishes,—fruits, as oranges, prunes, plantains,—and nuts, as cocoanuts, ground-nuts, almonds—as well as all the common grains, contain a smaller quantity.

3. REQUIREMENT: An adult needs 0·01 gramme of phosphorus per pound of body-weight. From the table (see Appendix VI) make a list of what foods you should eat in a day to satisfy this requirement.

Many cases of malnutrition are said to be due to a lack of sufficient phosphorus. When we compare the functions of phosphorus and calcium we shall see that phosphorus is as important as calcium for the expectant and nursing mother, and for growing children.

(C) **Iron**

1. FUNCTION: Although there is such a small quantity of iron in the body, it is very necessary that we eat enough food

containing iron each day to maintain that amount. Iron-starvation results in a condition known as *anæmia* Iron forms a part of the red blood-corpuscles which, as you have learned in Physiology, carry the oxygen from our lungs to every living cell. There the oxygen unites with glucose and other digested food-substances in a process called *oxidation*, which is in reality a burning up of the fuel foods to set free heat and energy. By means of this process of oxidation, the body is kept at the normal temperature necessary to life, and the organs receive energy to work. Iron plays an important part in this process and has, therefore, been called 'the key that unlocks the energy from the food that we eat'.

Iron has also a part in other important processes such as secretion, reproduction and development. The iron to be found in the germ and in the outer layer of grains gives evidence of its value in the growth and nutrition of young plants as well as animals.

2. Sources: We find iron in the yolk of egg, and in many vegetables and fruits such as spinach or greens, lettuce, cabbage, celery, beans, *dal*, radishes, cauliflower, lemons, raisins, brinjals, tomatoes, carrots, cucumbers, oinions, pumpkins, prunes, figs, watermelons. There is a less quantity in corn, sweet potatoes, plantains, oranges, grapes—also in mutton, fish, milk, cocoa, cocoanut, honey, macaroni. As has been mentioned above, most grains such as rice and wheat, contain iron in their germ and in their outer layers, but if these parts are polished off we do not get the benefit of the iron or other minerals.

3. Requirement: Adults require 0·0001 gramme or more of iron for every pound of body-weight. As is the case with other minerals, expectant and nursing mothers need a larger amount than other adults and growing children need most of all. Before birth a reserve store of iron is laid up in the body

of the infant. If the baby gets its mother's milk, this store of iron is sufficient for a year, but if it is fed with diluted cow's milk, the store is used up more quickly and the feedings need to be supplemented by some other source of iron which the baby can easily digest, as diluted orange-juice or tomato-juice.

Anæmic people are sometimes given iron-tonic by the doctor, but as a prevention of anæmia it has been found that the iron in fruit and vegetables and other foods is more beneficial to the body than medicinal iron.

It is necessary, therefore, that we plan our diet to include foods rich in iron, rather than run the risk of starving our blood. Large quantities of food will not nourish our bodies unless we have good, red blood.

(D) Sodium Chloride, or Common Salt

This is a compound of two elements, sodium and chlorine.

1. Function: This salt, like other mineral salts, is needed in the blood and in the tissues where it influences the work of those tissues in absorption and other processes.

2. Sources: We get a certain amount of sodium chloride by eating meat, but also add it as a condiment to our food.

3. Requirement: Common salt is the only mineral for which we feel a craving that is not satisfied by the amount present in foods. We need it particularly in connection with foods rich in *potassium*, as potatoes and green vegetables. There is, however, danger of our eating too much rather than too little salt. Large quantities may over-stimulate the digestive tract and interfere with the digestion.

(E) Other Minerals

Sulphur is absorbed by plants from the soil and used in the formation of proteins.

POTASSIUM helps to form the protoplasm of cells, the corpuscles of the blood, and milk. We get the necessary supply from milk, fruit and green vegetables.

MANGANESE: Scientists are now finding out the importance of the small amount of manganese that is in our bodies, as necessary to growth. Wheat is an important source of manganese.

(F) How Plants and Animals feed each other

The work of the body is carried on under the influence of the various elements. Every day a certain amount of each element is used up and excreted through the kidneys and intestines. For this reason we must keep on eating every day the foods containing the necessary elements.

The mineral elements which are excreted, enrich the soil by supplying food for plants. The plants, in turn, absorb these elements and, with the help of sunlight and water, form them into new foods for animals and men. In this marvellous way God has planned that the plant and animal world shall feed each other without loss.

ASSIGNMENTS

1. Using the material given you in this chapter, prepare in your notebook a tabular outline of the functions, sources and requirement of Calcium, Phosphorus and Iron, which will help you to keep the facts clearly in mind.
2. Using the tables (see Appendix) plan a week's diet for the Ranganathan family, which shall include sufficient mineral elements.
3. Make a pictorial diagram to show graphically how plants and animals feed each other.
4. Plan a kitchen-garden for your home, where you can grow the most necessary fruits and vegetables. Try to carry out your plan.

QUESTIONS

1. Why do dogs like to gnaw bones?
2. Poultry-raisers tell us that we can increase the number of eggs laid by our hens if we grind up bones for them to eat. Why?

3. Why is it that we cannot grow crops or flowers in our fields or gardens without manuring the soil frequently? What different fertilizers do farmers use in their fields?
4. Why is it that anæmic people continue to be thin and pale, no matter how much food they eat?
5. Why are good, strong teeth essential to health?
6. A lecturer on the importance of good posture made the following statement: 'A person's physical training begins nine months before he is born.' What do you think was meant by this?
7. It is a common idea in India that expectant and nursing mothers must not eat certain fruits and vegetables such as oranges and pumpkins. In the light of what you have learned in this chapter what advice would you give in this matter?
8. Why should mothers and growing children drink milk and eat vegetables?

SOURCE BOOKS USED IN COMPILING THE MATERIAL FOR THIS CHAPTER

Chemistry of Food and Nutrition, by Henry Sherman, Chapters IX, X and XI. Second Edition.

Article on Manganese, by McCarrison.

Dietetic for High Schools, by Willard and Gillet, pp. 59–70.

CHAPTER VI

CARBOHYDRATES

1. Composition

Because sugar, starch and cellulose have somewhat the same composition they are grouped into one class, carbohydrates.

Carbohydrates furnish carbon, oxygen and hydrogen. All carbohydrates to be used in the body must be changed to simple sugars. The digestion of starches and sugars begins in the mouth, where they are changed to simple sugars called dextrin and maltose. In the stomach there are no enzymes acting on carbohydrates, but the digestion may continue under the influence of swallowed saliva for a time. In the pancreatic juice there is another substance which completes the splitting of starch to maltose and then the intestinal maltose (simple sugar) can reduce this to glucose which will be absorbed into the blood stream. Cellulose (woody fibre) cannot be digested and simply serves as bulk to diet.

2. Function

Carbohydrates are known as the energy-giving or fuel foods and they supply energy in the most economical form.

What do we mean by fuel? Have you ever heard the human body called an engine?

Just as you need fuel to make an engine go—as for example petrol in a motor car or coal in a steam engine—so you need fuel to burn in the body. Even when one lies perfectly quiet and appears to be resting, the body is working. Wherever an attempt is made to make an engine work,

some of the energy will be changed to heat. So in our bodies the fuel foods enable us to work and furnish heat at the same time.

3. Kinds of Carbohydrates

The chief carbohydrates taken as food are sugar,—cane-sugar, milk sugar, maltose, glucose and starch.

Kinds : Sugars : granulated, powdered, lump sugar, brown sugar and jaggery, honey, syrup (glucose). Glucose is used in the manufacture of sweets and is not as sweet as ordinary sugar. Fruit sugar is much sweeter than glucose. Plantains and dried fruits are rich in sugar. You may use another sugar,—milk-sugar (lactose). It is obtained by crystallizing it from the whey of milk. It is not sweet but it is used often in mixing milk for feeding the baby.

Testing for Sugar

To make the sugar test, boil together a weak solution of copper sulphate with some sodium or potassium hydroxide.

1. Try the chemicals by putting one teaspoon of the copper sulphate solution in a test tube or clean dish and add the hydroxide solution until the precipitate that forms at first, dissolves. Then boil the mixture together and notice the colour that is produced.

2. Next put into another test-tube or dish a drop or two of syrup or some water in which you have cooked two raisins. Add the two chemicals as you did before, then boil the mixture and see how different a colour is given when sugar is present.

3. This colour is given by glucose, fruit sugar and milk sugar, but not by pure cane-sugar.

Dissolve a little granulated sugar in water, add the chemicals and boil as before.

4. Next, dissolve a very little granulated sugar in water and add a few drops of lime juice or strong vinegar and boil together for five minutes. Then add the chemicals, but be sure that you add enough of the hydroxide so that the mixture is blue, not green. Then boil it. What has the acid done to the cane-sugar ?

Do we need to eat manufactured sugar ? You eat sugar in fruits and in most vegetables as well as obtain sugar from digested starch. It is probable that you do not need to eat

sugar—but almost every one enjoys eating sugar. What are the dangers in eating too much sugar?

1. It is a good fuel food but does not contain vitamins or mineral salts. If you eat so much sugar that you do not eat enough of other foods to secure the right amount of these necessary elements, what will be the result?

2. Eating too much sugar may cause it to ferment in the stomach.

3. Sugar in concentrated form is irritating. Try keeping a piece of hard sweet against the side of your cheeks without removing it for some time and what is the result? The sugar you eat with other foods is less concentrated. So the best time to eat sweets is at the end of a meal.

Questions for Review

1. What happens to starch in digestion?
2. What two sugars are found in most fruits and honey? How can we make them from ordinary sugar?
3. How many sweets do you think you should eat? Why? When is the safest time to eat them? Why? If you have eaten many sweets, why will it help to drink water?
4. What are the dangers in eating too much sugar?

Starch

Starch is found in all plants, particularly in the seeds of cereals and pulses, and in potatoes and in other tubers.

If a substance contains starch, it changes to a blue colour when a drop of Tincture of Iodine is added to it.

Starch test

1. Test various substances for starch, as flour, rice, wheat, sago, potato, meat and eggs.

2. Mix ½ teaspoonful of corn starch with cold water in a test-tube. How is a solid substance changed when dissolved? Is starch soluble in cold water? What important difference between starch and sugar does this experiment show?

3. The effect of heat on starch:

a. Heat the above mixture—what change was caused by heating? Let it stand for a few minutes. Have the starch and water separated as in the uncooked starch?

b. Drop a teaspoon of dry starch into boiling water.

Cereals

The most important are rice, wheat, ragi, millet, barley and corn.

RICE

Roughly rice is divided into two kinds—namely, white rice and red rice or big rice and small rice. There are about sixty different kinds of rice. Some of them are:

Seeraka (cummin) samba
Sirumari samba
Sanna (fine) samba
Oosi (needle) samba
Illupai-poo samba
Mallikai (jasmine) samba
Kodai (summer) samba
Irku samba
Punuku samba
Kamban samba
Kaivala samba
Kunguma samba
Kurdai samba
Mutthu (pearl) samba
Moran samba
Malan samba
Seevan samba
Semblia piriyan
Pisanam
Malai Kuluki
Madu Villungi.
Kadai Kaluthan
Sembalai
Poombalai
Muttai (egg) kar
Kadappu kar
Mosanam
Manakatthai
Pitchavari
Isarkovai
Irakku mettan
Sornavari
Avasara samba
Pulluthu Viratti
Panaimara (palmyra) samba
Seengunni
Elephant-tusk
Arikiravi
Mei-kuruvi
Bridegroom samba
Aruvathanguruvai
Manvari
Thattavellai
Kalmanvari

Among the above-mentioned kinds of rice the *sambas* are the best. When it is cooked it is tasty. When you wash it it feels soft, and it has a good odour. Elephant-tusk is eaten by well-to-do people. As it is easily digested, it is also eaten by those who have weak digestion.

Good Paddy

Good paddy is heavy and golden-coloured. When crushed between the palms it looks fully developed.

Cultivation of Paddy

Seeds are taken from the previous year's harvest and preserved. They must be well dried. They are put in a sack and soaked in water for twenty-four hours, from one evening to the next. The second night the sack is taken out of water and either put in a dark closed room or buried in the rubbish-pit until the seeds sprout and are ready for sowing. The soil is already prepared well. If it is wet land with plenty of water around, cattle are hired to graze there for some time to fertilize the soil. Soon after even a light shower the land is ploughed two or three times and the surface is levelled. The sprouting seeds are taken to the field and sown. There must be plenty of water in the field for a few days. The plants grow to a height of half a cubit within thirty or forty days. At this stage there should not be much water in the field or the plants will die. On the other hand the field must not be dry for that will affect the yield of the crop.

The plants are then transplanted and the field is irrigated on alternate days. In the third month ears of paddy appear and ripen in another three months. If the plants are stunted in their growth more manure is used—chiefly ground-nut cakes, mixed with the soil. If the plants grow very tall the tops are cut off. The grains are green in colour and contain a milky substance which ripens and becomes hard grain. Then they change colour, become white, and then light yellow, and the plants droop with the weight. Then stop irrigating the field and let it dry. This helps the grains of paddy to dry and become hard. If it rains at this time, the grains drop off and lose their flavour. When the plants are dry they become

TRANSPLANTING PADDY

yellow or golden-coloured. They are cut and bound in sheaves which are put on the threshing-floor.

How Paddy is Prepared for Use

Next, men and women take the sheaves and beat them on the ground. Most of the grain, especially good, ripe grain, falls off. In order to thresh the rest they make oxen tread on the heap. Now the grain is separated from the straw. The paddy is then winnowed so that the chaff flies away and the grain is gathered in the granary.

Boiling Paddy. Put some measures of paddy in a caldron or a big vessel. Pour the same amount of water in, mix it well, and boil it. Do not take off the cover often. In some parts of the country the paddy is allowed to soak in water for seven or eight hours before boiling. The boiled rice is dried in the sun for some time and then in the shade until it is ready to be pounded.

Milling the Paddy. Before rice-mills came to the land women did most of the pounding. Rice pounded at the mill should be aired well. This rice loses much of its bran and the vitamin contained in it. Good rice should have full grains, all the broken ones and stones being removed from it, and it should be dried well. When you take rice to the mill, ask the man not to polish the rice. Polishing the rice costs more, and removes all the most nourishing part of the rice.

Cooking Rice. Wash the rice and take out the stones. Do not try to wash away all the bran. Some prefer white rice to red rice, but the latter is better and is said to contain more protein than the other. Straining the water from the rice also robs it of some of its protein. Raw rice is the best. It is used by Brahmins and by Telugu people.

PRACTICAL WORK

PROBLEM. To cook rice without straining off the conjee-water.

MATERIALS REQUIRED. Three fireplaces, three aluminium vessels with covers, water, some vessels for washing the rice, firewood, $\frac{1}{8}$ measure of the following kinds of rice : raw rice, samba, elephant-tusk rice.

Put the aluminium vessels on the fire. Pour into the first one $\frac{5}{16}$ measures of water and in the other two $\frac{6}{16}$ measures of water. Wash the rice and put it in when the water is boiling. Put the raw rice in the first vessel. Keep up the fire until it boils, stirring it often, then reduce the fire. Find out which rice boils first. One class found that the raw rice took 20 minutes to boil, Samba 30 minutes and Elephant-tusk 25 minutes.

But of all cereals rice is the poorest in protein, fat, mineral matter and vitamins and should be eaten with foods rich in nitrogenous substance as pulses, fish or ghee.

Good rice should be entire, clean and well husked and non-fermenting. It should not be mixed with any gravel or earth. New rice is apt to cause indigestion and diarrhœa. Rice should be stored in dry and well ventilated rooms having impervious floors. In hot and damp godowns, it ferments and becomes mouldy. When soaked in water diseased grains become opaque. Rice is frequently tampered with by traders, and old and new rice, or rice of different qualities are often mixed together and powdered chalk and lime usually added to give it an uniform appearance.

WHEAT

Wheat is the most important of all the grains. When ground and sifted it is separated into bran and flour. Flour is divided into three portions : Suji is the coarse grain derived from the outer coat of wheat and is most nourishing. The entire grain, atta, may be ground up and used for making conjee, bread and chapattis. This is most nourishing—but the bread made from American or Indian white flours lacks fat and vitamin.

Good flour should be white in colour without any smell or odour, silky to touch and hot. Fine wheat flours are apt to cause constipation. Flour should be stored in godowns with impervious floors.

The other grains mentioned are comparatively rich in carbohydrates, are valuable for their mineral matter and are good for growing children.

General Rules for Cooking Cereals (Conjees)

Pour the cereal slowly into boiling salted water. Cook directly over flame for about ten minutes. Then cook slowly. The quantity of water depends upon the kind of cereal. The more economical method of cooking rice is by steaming.

QUESTIONS

1. For what reasons are the cereal products valuable ?
2. Compare the composition of the different grains.
3. What changes take place in the proper cooking of cereals ?
4. Give general directions for cooking cereals.
5. Why should a school child eat sufficient food before starting for school ?

PRACTICAL WORK

Problems. To find some substitutes for rice.

Wheat Conjee

Buy whole wheat and wash it well, and dry it in the sun. Pound it in the mortar until the husk is off. Clean it and then grind it, but not too finely. Make it into conjee, with milk and sugar to taste.

Wheat with Curry

After pounding the whole wheat to get off the husk, wash it and boil it in grains just as you boil rice, and eat it with curry.

Cholam can be used in the same way, also other country grains.

JAGGERY

Jaggery is a form of crude sugar which we get from both the palmyra and the sugar-cane.

1. Palmyra Jaggery

Before the flower-branch of the palmyra matures its covering is scraped off and for seven days both morning and

evening, it is beaten with wooden implements and pressed between them until it is made soft. The top is also cut off. The result is that the flower-branch does not bloom but is ready to give out its sweet juice. On the eighth day a small earthen vessel (*kalayam*) is so hung on the flower-branch that the sweet juice from it falls in drop by drop. In the morning and sometimes in the evening also the juice is taken out. Every day the pot is painted inside with *chunam.* Some palmyra trees yield ten measures of this juice in a day. Men climb the trees and pour out the juice into a basket (*kuduvai*) made of palmyra fibre. When they bring it down their wives and children receive it in big earthen pots.

The juice thus obtained is taken to the sheds erected in the palmyra topes and there the women-folk beat it and make jaggery, or candy (*karuppu-katti*). Generally they make fire-places of clay though some use iron ones now. They construct them in such a way that from one to seven pots can be put on one fire. The firewood used is what they get from the palmyra trees, namely its leaves, stems and other parts.

Six or seven measures of palmyra juice are filtered into a large vessel (*koparai*) and heated. The juice boils and bubbles up. Some powdered castor-seeds are thrown in to prevent the juice from boiling over. In half an hour's time the juice becomes brown in colour. In another half hour it becomes more brown. This is the 'soft-ball' stage, so called because when taken in a ladle and poured into water it forms into a soft ball. The fire is not increased after this. The syrup becomes solidified (or caramelized) and after fifteen minutes reaches the stage when it does not dissolve and disappear in water readily. The pot is taken off the fire and for quarter of an hour the syrup is stirred with a long ladle. When it is ready to harden it is poured into cocoanut shells that have been soaked in water. Very soon it hardens and is taken out of the shells easily. This is called round jaggery or cocoanut-shell jaggery.

CHILLU KARUPATTY or jaggery in small pieces, is better-tasting than the ordinary jaggery. It is made out of good, clear palmyra-juice. When it is boiled into syrup, green gram or

Bengal gram, sesame, cocoanut chips and dried ginger are added to it. It is poured into small moulds of uniform size, made in wooden planks. These pieces are like sweets.

Palmyra Sugar Candy

This is prepared in the windy season. Good, clear palmyra juice is boiled until the soft-ball stage, when it is dropped into another vessel which is set aside in a fixed place and not moved. On the fortieth day crystals appear in the pot. It takes from one to four months to get it all crystallized. Some of the crystals are as large as small stones.

Sand Candy or Saral Candy

This is prepared like ordinary jaggery, but when the syrup is thickening it is kept on the fire longer and then poured into a vessel. On the third day it is all sand or gravel-candy. A pot with a hole at the bottom is procured and a filter is put into it. The candy is poured in and water is sprinkled so that any syrup which is left may be filtered out. Next the candy is dried in the sun.

PRACTICAL WORK

Material Required :

Two measures of palmyra juice, a wide-mouthed pot, a ladle, castor-oil or powdered castor-seed, fireplace and firewood.
Time : Two hours.

Directions :

Pour the juice into the pot, and boil it over the fire. In twenty minutes it will bubble and boil over. Put in the powdered castor-seed (the size of a pepper) or two or three drops of the oil. It reaches the soft-ball stage in an hour and a half. Take it off the fire, stir the syrup with the ladle for ten minutes and pour it out into cocoanut-shells. This should weigh 7½ palams when it is solid.

2. Sugar-cane Jaggery

Sugar-cane is stripped of its leaves and put into a sugar-cane press where it is squeezed very much as oil-seeds are in an oil-mill. The sugar-cane juice runs out and is put to boil in a vat or in pots over the fire. After it has bubbled up and boiled over seven times, which takes about two hours, it is reduced to one-third its quantity. The syrup strings when taken up on a stick. It is then poured out into pans or moulds to harden. This jaggery is used by the people of the districts around Madras, as palmyra jaggery is used further south.

PRACTICAL WORK

PROBLEM: To cook pure sweets for the home, to prevent children from buying dirty ones and very indigestible ones in the bazaar

Peanut Brittle—Melt two cups of sugar (in a pan) over the fire, stirring it constantly so that it will not stick to the pan. As soon as it is melted, remove it from the fire and stir in a cupful of peanuts or ground-nuts (already shelled) and pour it out to harden on a flat tin, marking it in squares before it is cold, so that it will break easily into uniform pieces.

Cocoanut Sweetmeats—Melt one viss of white sugar into a thick syrup. When the syrup is turning almost to sugar, put in the pulp of three good cocoanuts and keep on stirring until it becomes thick and falls in a mass from the spoon. Then take it off the fire and spread it on greased plates, cutting it into squares before it hardens.

American Fudge—Melt an ounce of cocoa-powder in one cup of milk and add two heaping cups of sugar. Boil until it hardens (not brittle) or reaches soft-ball stage (i.e. makes a soft ball in cold water). Remove it from the fire without stirring it and set it aside until it is perfectly cool. Then beat it with a spoon until it is creamy and pour it out on a greased plate, and cut it into squares.

CHAPTER VII

FAT

1. Composition

Fats and carbohydrates contain large amounts of carbon, and on this account are called fuel foods. Fats also contain hydrogen and oxygen. But unlike carbohydrates fats are not digested in the stomach. A ferment in the stomach breaks up some of the fat into a fatty acid and glycerine and final digestion takes place in the intestines. During digestion fat is emulsified, i.e., divided into tiny globules. When it is emulsified it looks like milk.

2. Function

Fats and oils like carbo-hydrates give energy, but they have about twice as much energy-giving power. We can compare them to a lump of coal and a block of wood. If they are of the same size and are burnt, we find that the wood will burn much more quickly and the coal will burn a longer time thus giving off more heat. By measurement it has been proved that one cup of ghee gives two and one-fourth times as much energy as one cup of sago. Fat like coal burns slowly and gives more heat. So the special function of fats is to supply energy in the most concentrated form.

3. Experiment :

Action of Oil and Water : Pour a little cocoanut or cotton seed oil into a test-tube, add the same quantity of water, and shake the tube, set aside for a moment and examine. Which material rises to the top ? Is oil soluble in water ?

Emulsion of Fat:

In a test-tube put a bit of soap and two tablespoons of water. Heat until the soap is melted. Add ½ teaspoon of oil. Shake and examine. What familiar food does the mixture look like? Set the tube aside for a minute. Does the oil rise to the top? In what form does it now exist?

Note

If fats are emulsified by means of soap, where does the soap come from in the process of digestion? The soap is thought to be formed by the action of the alkali of the pancreatic juice upon some of the fatty acids formed by the splitting up of the fat. By means of soap thus formed fat is emulsified during digestion. Fats pass through the intestinal wall as fatty acids and glycerol and go to the blood to be burned in the muscles for fuel or to be stored as fat until needed.

4. Kinds of Fats

These are fats and oils. Oil is the liquid form of fat. But liquid and emulsified fats are most easily digested, hence more desirable.

			Grammes of Fat in 1 oz.
Animal Fat			
Cream	...	...	5·2 *gr.*
Butter	...	...	23·1 *gr.*
Ghee	...	...	28·1 *gr.*
Cod-liver oil	...	...	28 *gr.*
Meat fats	...	...	26·4 *gr.*
Vegetable Oils			
Cocoanut oil	...	...	
Gingelly oil	...	...	
Linseed oil	...	...	
Ground-nut oil	...	...	28 *gr.*
Olive oil	...	...	
Cotton seed oil	...	...	
Mustard oil	...	..	
Cocogem	...	...	
Margarin	...	...	23 *gr.*

N.B.—One ounce equals 28·3 grammes.

5. Daily requirement of Fat

A vigorous man at hard labour can digest fat of any kind without any difficulty, and needs it because it gives so much fuel. Fats retard gastic digestion and delicate persons must be careful about taking it with other foods which are hard to digest such as palagarams and fried foods. We cannot get along without any fat because fat can be stored in the body to be used as it is needed.

An average boy or girl needs 1½ to 4 oz. of fat daily or 25 to 75 grammes per day.

QUESTIONS

1. What is meant by a fuel food ?
2. Why should fat be taken daily ?
3. Compare the cost of different kinds of fat.
4. How is fat changed in digestion ?
5. What food materials are rich in fat ?
6. Refer to the protein chart on page 17 and work out the number of grammes of fat in a day. Are you getting enough fat in your diet ?

OILS

The Tamil people use gingelly (sesame) oil for food purposes while the Malayalis of the west coast use cocoanut oil. Some Tamilians fry *appalams or pappadams* with either pure cocoanut oil or cocoanut oil mixed with gingelly oil. There are two other oils in common use,—castor-oil and margosa oil. Cheap oils sometimes used in adulteration of other oils are ground-nut oil and *pinna-kai* oil.

1. Gingelly Oil

Be careful in buying gingelly oil. Smell it to see if it is pure or adulterated with one of the cheap oils.

The gingelly or sesame plant grows to two or three feet. The tiny seeds are neatly arranged inside the pod. When they are ripe the plants are plucked and left to dry

on the threshing-floor. When they are dry they are beaten with sticks till the seeds are separated. These are cleaned and put in the oil-press. About one-fourth of a *kottai* (15½ measures) of oil-seeds can be put into the press at one time. To this are added in small quantities fifty palams of jaggery or crude cane-sugar and some water. For six hours the oxen turn the oil-mill and oil comes to the top, the residue becoming flat cakes. This oil is taken out with a spoon and poured into tins. The oil that is between the cakes cannot be taken this way and is absorbed by a piece of white cloth round a strong wire that is poked into all sides. About eight measures of oil are produced from 15½ measures of gingelly-seeds. The oil is used for seasoning curries, frying vegetables and making sweetmeats. Some take it raw, like ghee, with their food. It is also used for oil-baths and for oiling the hair.

2. Cocoanut Oil

Ripe cocoanuts or copras are broken and the white pulp is dried in the sun, then it is put in the oil-press and oil is extracted just as gingelly oil is. Those who want pure oil in small quantities prepare it at home. They buy ripe cocoanuts, scrape the kernel and take the milk which, when boiled for a long time, yields sweet-smelling oil. Cocoanut oil is also used for curries and for making sweets. If prepared at home, as above described, it can be eaten with rice just like ghee. It is applied to heal wounds. Heated with eucalyptus or camphor it can be rubbed on the chest for colds or coughs.

3. Ground-nut Oil

Ground-nuts are broken and the kernels inside are put into the oil-press and oil is extracted as above. This oil can be used for making sweetmeats.

4. Pungakai Oil

The fruit of the Punga—(Pongamia-glabra) tree is the size of a gooseberry. These berries are dried in the sun, and the inner part is put in the oil-press.

5. Illupai (Bassia Longifolia) Oil

Illupai Oil is prepared in the same way.

This and also the two previous oils, are used for burning in brass or earthen lamps.

6. Castor-Oil

Ripe castor-seeds are boiled and dried thoroughly in the sun for two or three days. They are then cleaned and put in the mortar and pounded well. Then the pounded material is put in a large vessel with two parts of water, and stirred and boiled. Frequent stirring is very necessary. Water evaporates and oil floats on the surface. This is taken off with a spoon or ladle and poured into a small vessel. After all the oil is skimmed off, more water is poured in and boiled again. Again oil comes to the top. This less concentrated oil is called 'water oil' and is sometimes used for children. After all the oil is gathered, it is put on the fire and boiled like cocoanut oil. Some add onions to it. Then the oil is strained into a bottle.

Castor-oil is used for some curries like *dal* curry and fowl curry. It is burned in lights, as shown by its Tamil name, 'Light Oil'. Its chief use is medicinal, as a purgative. Indians use it in many ways. For dysentery they give it in milk. They mix it with *chunam* to rub on the outside of the throat for sore-throat. They mix it with milk to wash out coal-dust from the eyes. They use it freely as a purgative in the hot season, believing that

it cools the blood. In Tinnevelly district many use this oil for their hair and for oil-baths.

7. Margosa Oil

Margosa seeds are gathered and dried. The hard covering is removed and the kernel is put in the oil-press. People use this oil for lamps.

PRACTICAL WORK

Problem : To make castor-oil.

Materials Required : Fire-place, firewood, an earthen vessel or *chatty*, two other vessels, mortar and pestle, half a measure of castor-seed, one onion, fifteen cummin, a few curry-leaves.

Time Required : An hour and a half.

Directions :

The castor-seeds should have been boiled and dried thoroughly two or three days before. Pour one measure of water into the *chatty*. Clean and pound the castor-seeds until oil oozes out. Put them in the boiling water and heat them further. Stir them well. In an hour's time the water evaporates and oil floats on the surface. Strain the oil into another vessel and take the *chatty* off the fire. Pour some warm water into the *chatty* and stir it well. Some more oil rises. Skim that off and add it to the other oil. Next put on the fire the vessel in which you have the oil. Put the onion, cummin and curry-leaves into it. Let it boil so that the water evaporates. Roll a small piece of cloth on a stick and dip it into the oil to test it. If it burns well then it is ready to be strained. Take the oil and measure it. You should have one-eighth of a measure.

SOME HINTS FOR THE USE OF OIL IN COOKING

1. If the oil is not pure it boils and bubbles over, therefore heat it with some tamarinds and chillies. Four chillies and the tamarind from one seed will be enough for quarter of a measure of oil.
2. Use a slow fire.
3. Do not pour water into the oil.
4. The flour with which you make sweets should be ground well. If it is not ground well they will be oily.
5. Do not wait till the oil boils over.
6. Stir the foods which you are frying in the oil and turn them over, lest one side be burnt.

CHAPTER VIII

VITAMINS

Composition

If you grow and keep well, you need all the substances called vitamins. Little is known about Vitamins except that they are necessary for health and growth. Chemists have not been able to separate them, for they exist in such small amounts and in such an unstable form. From experiments in feeding animals and from watching what people eat, we have found out what food contains them, and that they are absolutely necessary.

Function

The function is recognized by the definite symptoms which follow when they are absent from the food taken, or have been destroyed by the method of preparation.

KINDS

Vitamin A

Vitamin A is called the fat-soluble vitamin. It is found especially in animal fats, in which it is believed to be soluble, such as milk, cream, butter, cheese, eggs, liver and fish oils.

It is not found in vegetable fat, but it is present in green leaves, spinach, cabbage, carrot, tomatoes and sprouted dals.

If you live near open fields see how many green edible leaves you can find. Make a list of them and note how little they cost. Remember they contain this important vitamin, and that ordinary cooking does not destroy vitamin A. It is destroyed by long cooking and if the food is exposed to the air during cooking.

Experiments on white rats show that if they do not get foods containing Vitamin A, they decline in their rate of growth, lose their hair, have poor appetites, a bad digestion and eventually develop a disease of the eye. The eyes become inflamed, swell, shut and finally go blind. If some food containing Vitamin A is added to the diet, the animal will promptly recover. Night blindness developed in a boarding school in India where the boys were not given animal fats or green vegetables. The doctor prescribed ghee and green vegetables and there was marked improvement. We read of similar experiences of doctors in China and Japan where the diet is mostly rice and is poor in animal fats, and green vegetables. This vitamin is important for good health and is a protection against disease, especially the diseases of the skin and mucous membranes.

Vitamin B

Vitamin B is found in many vegetables such as potatoes, spinach, greens, cabbage, peas, tomatoes, and turnips; in fruit such as oranges and guavas; in milk and eggs; in whole grains such as wheat, maize, cholam, cambu and ragi; liver, kidney and pancreas; and dals and nuts. It is not destroyed by cooking, but much washing of rice dissolves it out, and it is destroyed when soda is added to cooking vegetables. It is necessary to eat food containing Vitamin B to keep our bodies healthy and in good repair. It is a great aid to the appetite and digestion as well.

According to the diet of India, we ought to get Vitamin B mainly from the grains we eat. But if that grain is polished rice, then we do not get this vitamin, for it is found in the outer layers of grains. It is best to pound

the rice at home, and wash it as little as possible after pounding. Even then we will not get enough Vitamin B, unless we eat other foods such as dals, greens and nuts, and other whole grains like ragi and cholam.

There is a nervous disease causing paralysis, known an Beri-beri, which is very common in India and oriental countries. The people contracting this disease live mainly on polished rice and a limited amount of other foods.

This disease can be produced in pigeons and fowls fed on polished rice; but on giving Vitamin B, it is cured rapidly. With people it takes a longer time to cure. (See Col. McCarrison's *Study of Beri-beri in India.*)

Vitamin C

Vitamin C is contained in citrus fruits especially lemon and orange juice, tomato, yellow turnips, cabbage and sprouted grains. There is a small amount found in green vegetables and potato. There is a little found in milk but it is destroyed in heating. This vitamin is more sensitive to heat than A or B. The tomato does not lose its property when cooked, but as a general rule in order to get Vitamin C, these foods should be cooked for as short a time as possible. The strictly fresh food is essential.

Vitamin C is not stored in the body, so a daily supply is needed. When deprived of the vitamin, scurvy results. It is important in the development of bones and teeth and keeping the blood supply pure. It is essential to give babies who are fed on boiled milk, fruit or vegetable juice.

Vitamin D

Vitamin D is found in cod-liver oil, whale-milk and eggs, and is radiated through sunlight. A lack of this vitamin

causes rickets in children. The bones become soft and bend. It has been cured by treatment with sunlight or ultra-violet rays, or by giving cod-liver oil. When there is much sunlight in India, mothers ought to make use of it by allowing their children to run about in the sun.

Vitamin E

Vitamin E is found in grains, especially wheat germ, liver and leaves. When there is a lack of this vitamin there is failure on the part of the body to utilize iron, and anæmia results. Experiments on rats show that a lack of Vitamin E retards reproduction or the offspring is weak. Vitamin E is not affected by heat.

QUESTIONS

1. Name several ways of cooking vegetables. Which ways insure that the vitamins are not destroyed?
2. Compare the five kinds of vitamins with regard to the effect of heat upon them.
3. Name the edible greens. Why do they contain Vitamin A? (Refer to McCarrison's *Food*, Chapter X.)
4. Make a list of foods which contain very little or no Vitamins. (Refer to the same book, Chapters X-XII.)

PRACTICAL WORK

Problem: To make fruit jelly.

1 teaspoon or 7 grammes *agar-agar*.
3 teaspoons lime juice or orange juice.
2 teaspoons sugar.
Prickly-pear juice for colouring if desired.

Dissolve the *agar-agar* in water and boil it with the sugar. Remove from fire. Add fruit juice and colouring, pour it into a cup and set it in a cool place to harden. Serve it with milk and sugar or soft custard.

SOURCE-BOOKS USED

Dietetics, by Carter, Howe and Mason.
Newer Knowledge of Nutrition, by McCollum.
Laboratory Manual of Dietetics, by Rose.

CHAPTER IX

WATER AND ROUGHAGE

Introductory Experiments :

(1) Peel a potato and weigh it in a chemical balance, recording the weight in grammes to one decimal place. Put the potato away on a high shelf for a week, where no one will touch it. At the end of the week weigh it again and compare the second weight with the first. What change has taken place? Why? What percentage of its own weight has it lost? In the table of composition in the appendix find the percentage of moisture in a potato. Compare with your own result.

(2) Peel another potato and grate it on the cocoanut-scraper. Hold the pieces in a piece of thin cloth and squeeze them into a cup of water. What are the white grains that you find in the water? Open the cloth and look at what remains. You have squeezed out the nutritive elements and the moisture and have left only the *cellulose* or woody fibre, the skeleton of the potato. What per cent of the weight of the potato is the weight of the woody fibre?

When we look at the table of composition of common foods, we are surprised to find, in many cases, how low the percentage is of protein, minerals and other important elements which we have been studying. The bulk of our food consists, in most cases, of water and indigestible fibre.

I. WATER

1. Function

Water has many important uses in our body :

1. It is needed in every part of our body by the blood and the various tissues, to keep them moist, and to hold the various elements in solution. The supply must be maintained.
2. It plays an important part in digestion. While it does not change its own form, like the other food-stuffs, it holds in solution the other food-elements as it carries them through the body, thus aiding in absorption. It also stimulates the flow of the digestive juices.

3. It assists *excretion* through the skin, the kidneys and the intestines. We prevent our kitchen pipes and drains from becoming blocked with refuse by flushing them frequently with water. Similarly we need much water to help carry off the water-matter from our bodies before it becomes injurious to us.

2. Sources

Look at the tables in the Appendix. What foods contain the highest percentage of water? What foods contain little or no moisture? In addition to the water which you get in foods, how much water do you drink in a day? When do you feel most thirsty?

In order to perform these various functions we need at least four or five tumblers of water a day besides what we get in our food. If we are leading an active life, or if we are perspiring freely, we need six or eight tumblers a day. There is no harm in drinking water at meals, provided we do not drink while we have food in our mouths and thus 'wash down' the food without chewing it. As has been shown, water is an important preventive of constipation.

II. ROUGHAGE

Under the term 'roughage' we include the fibrous parts or cellulose of fruit and vegetables, and the bran-covering of grains, such parts as pass through the intestinal tract without being absorbed, and are expelled with the waste materials.

In preparing food for little children we have to squeeze the more nutritive parts of fruits and vegetables through a strainer in order to get rid of much of this indigestible material which is too much for their delicate systems. Such softening of the food, however, would soon have a bad effect

on any but very young children, by causing constipation. These indigestible materials give bulk to the food and stimulate the action of the intestines in pushing through the colon and expelling, together with this undigested residue, the waste products which are brought by the blood from the organs.

When grains are husked and polished and ground into flour by machinery, as is increasingly done in these days, all the outer layers of the grain are removed. As we have already learned in another chapter, these outer layers contain most of the mineral and vitamin contents of the grain, together with all of the husk or bran which is an important source of 'roughage'. The cows who eat the bran and drink the 'conjee-water' get the most nutritive parts of our rice! In America the companies who mill the flour now clean and prepare the bran and sell it in separate packages, so that people who suffer from constipation can eat a little bran with their *conjee* or bake it into cakes along with flour. In India we can buy 'brown rice' and 'red rice' which have still some of the outer layer on it, and can use cracked wheat and hand-milled *ragi* which give us the necessary bran.

While we need to have a certain amount of roughage every day, it is equally important that we should not load our systems with too much coarse material which may cause diarrhœa. Fruits and vegetables must be eaten every day, but must be eaten in moderation. Because a child is upset by eating five or six plantains or mangoes at a time, some mothers conclude that all fruit is bad for children. If the child ate one plantain or mango a day, in small quantities, only good effects would be noticeable. Similarly, many people have become prejudiced against the coarser grains—*ragi*, *cholam*, *kambu*, *thenai* and

varagu,—because they cause diarrhœa. A glance at the tables of Composition will show that high nutritive value these cheaper grains have, which are the bulk of the poor villager's diet, and the fodder of his cattle. Because they are hastily and carelessly ground, often on a mud floor where the flour is swept up with dust and sand, it is true that these grains do cause a great deal of intestinal obstruction. With careful preparation, however, these grains can form a valuable part of diet, in small quantities, to counteract the effect of eating too much polished rice and finely milled flour.

III. CONSTIPATION OR FAULTY ELIMINATION

If the colon becomes clogged with these masses of waste-material, putrefaction sets in and poisonous products are released which are absorbed by the blood and carried all over the body. This condition, therefore, causes headache, dizziness, pains, and general feelings of dullness and langour. It may, if neglected, pave the way for serious disease. It is very necessary that we eliminate waste materials at least once a day.

Some people have the habit of taking drugs, called purgatives or cathartics, at frequent intervals, to expel waste material. These medicines stimulate the intestine to great activity for a short time, but have no permanent effect. If one depends on drugs, the muscular walls of the intestines will become 'flabby' and unable to do their work without the assistance of increasing doses of medicine. In times of illness when recommended by a physician, these purgatives may be given, but in ordinary life it is far better to combat constipation by the more natural means of *exercise*, *habit* and *diet*. A few health-habits are here suggested which, by the exercise of some

will-power, can be so firmly established in youth that they may both conquer and permanently prevent constipation with all its attendant ills.

1. Exercise

Get some hard exercise every day to counteract the long hours of sitting in school. Walk briskly, run, jump, skip rope, and play active games. Sweep, grind curry stuffs and carry water. If you are already constipated, you will feel languid, lazy and head-achey, and it will take some will-power to rouse yourself to activity.

2. Habit

Form a habit of giving the bowels a chance to move at a regular time each day, preferably in the early morning. Choose an hour when you can feel unhurried.

3. Diet

(i) Drink from six to eight tumblers of water a day, whether you are thirsty or not. The tumbler of water drunk when you first get up in the morning, a half hour before you eat, will help you the most, although it is hardest to drink. Some put salt in this early morning drink of water, saying that this will make it pass through the alimentary canal without being absorbed. Some find that to drink a cup of *hot* water in the early morning, starts the action of the bowels almost at once. In any case the early morning drink is an important health-habit.

(ii) Eat plenty of *vegetables*, with their skins on where possible, both at noon and at night.

(iii) Eat some *fruit* every day, even if it is only a plantain or a prickly-pear fruit. Be sure that it is *ripe*.

(iv) In place of rice-conjee or cakes made of rice flour, eat conjee or cakes made from the coarser grains for your morning-meal, i.e., ragi, cholam, kambu, or cracked whole-wheat.

(v) If you are in the habit of buying polished white rice, buy brown or red rice instead.

You may find the above rules much harder to carry out than a weekly dose of castor-oil, but your efforts will be rewarded by the gift of Health.

QUESTIONS

1. Plan a week's diet for a person suffering from constipation.
2. In what ways do we lose water from our bodies?
3. Why are we most thirsty in hot weather?
4. It is often said that sick people must not be given any water, although they beg for it. Is there any foundation for this belief?
5. Experiment with ways of preparing and cooking the coarser and cheaper grains.

CHAPTER X

REFORMATION

It was the last class on Food at the Mothers' Club and fifteen mothers were sitting in a classroom at the girls' school discussing what they had just learned about the balanced diet. At a previous class they had weighed one person's food for a day, of the sort and quantity that they all ate in their homes, to calculate how many grammes of protein, fat and carbohydrates they were eating. Mrs. Ranganathan found that by these calculations each member of her family was getting each day : *

Proteins (mostly pulses)	...	75 grammes per day.
Fats (vegetable, oils, cocoanut and a little ghee)	...	85 grammes per day.
Carbohydrates (polished rice and sugar) ...	...	643 grammes per day.

As she reflected further she realized that really only her husband was getting this amount. Sundaresan was doubtless getting far more fats and carbohydrates. She herself and the other children rarely ate the amount of protein here included. She had long since come to the conclusion that they all got very little in the way of vitamins and minerals, for all disliked vegetables and milk and rarely spent money on fruit.

On the board Miss Arokiam had written the following table :

* McCarrison's *Food*, p. 115.

THE BALANCED DIET*

Food Elements	Amount per day	Nature
Protein ...	70 to 100 grammes according to age and activity.	One-third must be animal proteins, as milk-products, eggs or meat or fish. Vegetables proteins should include pulses and at least two cereals.
Fats ...	50 to 90 grammes according to age activity and digestion.	One-half should be animal fats (for Vitamin A) as milk, curds, ghee.
Carbohydrates.	250 to 450 grammes according to age or activity.	Mix the sources, getting them from vegetables, cereals and sugars. Avoid too much sugar. Avoid polished rice.
Vitamins and Minerals ...	......	Will be sufficient if amount of vegetables and fruit is four times as great in weight as amount of meal and *dal*.

The mothers all realized that, in order to live up to this requirement, they must increase the amount of

1. Milk and milk-products, as curds, butter-milk, ghee.
2. Wheat, ragi, or other grains with more protein-content than rice.
3. Vegetables, including both tuber and root-vegetables and green leafy vegetables.
4. Fruit.

If these foods should be increased, the amount of rice and sugar would naturally be decreased. Moreover, Miss Arokiam explained that for children the fat should not be given to them in the form of too many fried palagarams. They should get their fat from the milk-products, and the

* McCarrison's, *Food*, pp. 112, 111, 38.

vegetable oils used in curry, or in roasted nuts. She reminded them of their earlier lessons in the physiology of

BUILDING STRONG AND HEALTHY BODIES

digestion. If there is too much of it at a time, it cannot be digested and the result is indigestion. Even older people cannot eat much fried food without suffering indigestion, how much less can children with their weaker organs.

Coffee and tea for children were also banned. They contain no nourishment at all except for the sugar and milk served with them which they can get without the harmful stimulant. Children's nervous systems suffer under too frequent stimulation. If they cannot drink plain milk, Miss Arokiam recommended for all but the baby, cocoa or 'Ovaltine' which are very nourishing in themselves as well as giving a flavour to milk.

The mothers were very thoughtful on this last day. They recognized the truth of all these statements, now

that they had learned the elements of the science of Nutrition. But how could they put them into effect?

'My children simply won't eat vegetables,' one mother remarked while the others nodded their heads. 'You say that the curry must not be too hot. If it isn't hot, they won't eat it. They take the vegetables and throw them away, and eat only the curry and rice.'

'My husband simply won't eat wheat,' another complained. 'I tried giving him wheat instead of rice one day, and he was angry.'

'And milk!' complained Mrs. Ranganathan. 'Not even my baby will touch it. They throw it up if I force them to drink it.'

'I know. I remember that I did the same as a child,' said Miss Arokiam sympathetically. 'When I was in the west, I marvelled to see how contentedly some English children eat only bread and milk, or plain vegetables and vegetable soups without any pepper or spice, and drink cup after cup of milk. And their children are fat and sturdy compared to ours. Ours are thin and nervous and they cry a great deal. But I have seen some Indian babies, whose mothers fed them and trained them properly, grow just as fat and healthy. I have thought about it a great deal and I think the difference is just this. We feed our children everything which we eat from the time their teeth come, is it not so? We let them have a taste of hot curry, or we put a palagaram in their hands, or when we are travelling we give them *muruku*.'

'How can one refuse when the child cries for it?' demanded a mother indignantly.

'It is hard, but once the child tastes the spicy food, and the very sweet food, its taste is spoiled for the plain and nourishing food. Now if we could prevent the baby

from ever getting a taste of coffee or curry or spice, he would never miss it. Isn't that so?'

'But what about these children who have tasted it and eaten it for years? How can we change now?'

'I suppose the only way is to starve them into it. Give them nothing else. Not the grown-up people of course! They have a right to choose their food. But we want to train the children to be wiser. Have none of the wrong kind of food in the house, and give them no money and no chance to go to bazaar. They will make a fuss and refuse to eat it, and perhaps starve for a few days, but in the end, hunger will conquer them, and they will be glad to take what there is, and then in the course of time they will get used to it.'

There was a storm of protest from all the mothers.

'What! Starve our children!'

'I cannot endure to see them unhappy. I love them too much.'

'No, no! We are not these hard-hearted westerners. We Indians love our children.'

'Yesterday,' continued the teacher, 'a little boy came to the dispensary with his right arm broken. He fell off a wall. His mother brought him to the doctor. The bones were all crooked. The doctor tried to take his arm to straighten the bones so that they would heal, but the child cried because it hurt him even to have his arm touched. The doctor called two nurses to come and hold the child down so that she could straighten the bones and bandage the arm, but the mother snatched him away and held him. "You shall not hurt my baby!" she said. "But I *must* hurt him if his arm is to be straight," the doctor said. "No", answered the mother, "let it be as it is. I cannot bear to hear him cry." "Then go

outside and wait", said the doctor. "Unless I hurt him he will have a crooked right arm all his life." "You are a hard-hearted woman," retorted the mother angrily. "You do not know a mother's love. I will not let you touch my child." And she actually took him away with his arm just like that.'

'What foolishness!' exclaimed a mother. 'Of course he must be hurt for a few minutes. What will he think of his mother's love when he becomes a man with a useless right arm?'

'A foolish, ignorant woman!' they all agreed.

'When the doctor put a knife into my Sita's throat to cut out her tonsils, it was as if she cut me,' said Mrs. Ranganathan, 'and the child suffered many days. But now she is much better for it.'

'You mean,' said another mother to the teacher, 'that if we refuse to starve our children into eating the right food, we are as foolish and silly as that mother. Oh, you are very clever with your stories!' and they all laughed, and got up to go home.

As Mrs. Ranganathan rode slowly home in her cart, she thought very seriously about that little boy with the crooked arm. Was she letting her mother-love do her children as much harm as that? Was she crippling their bodies because she was afraid to see them unhappy for a few days? It was an unpleasant and uncomfortable thought, but she was a sensible woman and she faced it.

When she got home, she talked it over with her husband and with Kamala, both of whom were much interested in the subject by this time, and won their co-operation. They mapped out a plan of campaign, thought it over carefully, and finally put it into effect.

When the children came to the kitchen for coffee one

morning they found none made except for their father. The rest were offered a new brownish drink called cocoa which Kamala had learned to make at school.

'Chee!' exclaimed Sundaresan, spitting out the first mouthful. 'What are you giving me?'

'It's milk. You can't fool me,' said Sita, flinging down her cup.

'This is what comes of learning English ways at your school,' said Narayanan, disdainfully. 'Why should we eat western food?'

'It is *not* western,' retorted Kamala. 'You just look in the geography and see where the cocoa-bean grows. Why should we ship it all off to the western countries?'

They stormed and fumed and pleaded with their mother, but she was adamant. They appealed to their father, but he gave them no help. Nor could they get any pocket-money out of him. The only thing they could do was to try to pour the cocoa down the drain, but this was prevented just in time by their mother. 'You may want it later,' she remarked calmly, and set it aside on a shelf.

This was only the beginning of a different day. When they assembled for the nine o'clock meal, they were given cracked, boiled wheat to eat with their curry. No rice! And the curry was so thick with vegetables and *dal* that they could not escape them. And the curry was different; it was *flat*! The children made faces and spat it out. Sita tried to get up and throw hers away, but her father sternly prevented her.

'You need not eat it if you don't want it, but you are to sit still till we all finish,' he decreed, while he and Kamala ate bravely on. Kamala nearly choked over it, but she had allied herself with her parents so she pretended

to like it. Mrs. Ranganathan was distracted by the howling of the baby who had refused both milk and conjee, and was expressing his opinion of this unusual treatment. The other three children sat in grim silence, refusing to eat. Strangely enough, neither father nor mother seemed to notice. No one coaxed or persuaded them. When their father had finished, they accepted plantains and ate them unwillingly, feeling very sorry for themselves.

That noon when Sita and Kamala retired to a corner of the school compound for their tiffin, Kamala produced a tiffin-carrier of rice and curds, and lime-juice instead of coffee to drink. Sita was hungry but she refused to touch it. She demanded the usual palagarams, but Kamala showed her that she had none. She begged for money to run down to the sweet-meat seller at the corner, but Kamala had none, and prevented her from borrowing any.

At home the boys were faring equally badly. Narayanan came in from his prescribed morning-walk feeling very hungry, and demanding palagarams. His mother offered to heat up the morning cocoa or milk, or the morning's wheat and curry, but there was nothing else except the raw eggs which the doctor advised. He refused them all, and flung himself down indignantly on his cot. He would die, and then his mother would feel sorry. Sundaresan came in at twelve loudly demanding food.

'The doctor says you may have rice only once a day,' replied his mother, offering him a small quantity of the morning's wheat and curry. He wept and stormed and threatened to kill himself. His mother hardened her heart. This was terrible, but she must carry it through. The baby added his howls to the turmoil, for he was being

offered mashed potato and brinjal mixed with half a soft-boiled egg, and the loathsome milk he had already refused three times.

At four o'clock, there was only the same old cocoa and some *itli*. They ate the latter, and more plantains. Sita and the baby were offered milk and wheat-conjee at six-o'clock, which they indignantly refused, but after their mother left the room, Sita drank some, and finally finished it with the baby's help. She pretended to have spilled it. Then, crowning indignity, they were both put to bed at seven, to keep each other company. They howled in chorus, despite their father's stern commands, until at last they fell asleep exhausted. Meanwhile the others were called to eat at seven-thirty, and found rice at last, but with more mild curry and vegetables and curds. Sundaresan, who came in at nine o'clock from a cinema, was informed that thereafter he would get nothing if he came late.

And so the days went on. Fortunately Mrs. Ranganathan had a stubborn side to her nature. The more fuss her children made and the more angrily her visiting relatives and neighbours protested, the more determined she was to prove herself in the right. Fortunately, too, her husband upheld her. It was he who insisted that she should set the food before the children and leave them to eat it or not eat it, without coaxing and persuasion. He had read in a book that refusing to eat was only a way of attempting to attract attention and he believed it. She found that, little by little, they began to eat when left alone. Even milk and conjee, which they swore never to touch, vanished as rapidly as palagarams ever had. She rarely spent time squatting over a pan of oil, frying pastry and palagarams. Instead she pounded wheat, experimented

with ragi, prepared vegetables in different ways, and learned to make her own *ghee*. During the rains Narayanan, who was still out of school, helped to get the tangle of prickly-pear out of their back yard so that they could make a garden as the doctor had recommended. He planted vegetables and flowers, and enjoyed tending them. Sita, who was allowed to go to school only in the morning, helped him. Their father brought home small papaya and guava trees to plant, and soon the whole family was absorbed in growing things. Sundaresan had joined the Boy Scouts at his father's insistence, and was out every afternoon either with them or playing football or hockey. Now that the music lessons had been stopped, Kamala stayed at her school sometimes to play badminton and came home feeling so refreshed that she finished her lessons and fell asleep soon after nine. Even Sundaresan studied hard without a tutor and got better monthly marks, for he felt better and his mind was clearer now that he ate less and exercised more.

At the end of the school year a remarkable thing happened. Sita, who had attended school half a day only, passed and was promoted. Her mother took her to see the Doctor-friend to tell her the good news. The doctor exclaimed at sight of the child :

'I should never know her ! How she has grown ! And see how fat she is ! Did you really carry out all that I told you ?'

'I really did, Doctor Amma,' beamed the proud mother. 'But think of her passing when she only studied half a day !'

'I am not at all surprised,' asserted the doctor. 'She was fighting against great difficulties before. She wasn't getting enough oxygen. Those hookworms were stealing

her strength. She wasn't getting the food her growing body needed, and she was too tired to digest what she did get.'

'Now she drinks three or four ollocks of milk, and she eats conjee and vegetables and fruit,' boasted her mother. 'And she sleeps at noon and sleeps from eight o'clock at night. Is it not a miracle?'

'No miracle at all,' said the doctor. 'I wish we could have a few more mothers like you in this town. Is it a miracle for plants to grow when they have sunshine, manure and water?'

At the doctor's request Mrs. Ranganathan brought her other children, to be examined and weighed. Sundaresan found that he had actually lost ten pounds. Kamala had gained twelve pounds, Narayanan nine, Sita seven and the baby three. Narayanan's lungs were so much improved that the doctor promised him that he might attend school in June if he would drink milk and eat raw eggs all summer. His eyes were quite well. Kamala reported that she never had fever nor headache any more, and her blood was as bright red as the best blood on the chart. She was so well now, and so ready to eat what was set before her, that her parents were actually going to let her finish High School.

'I can hardly wait for that school-doctor to see them at the next physical examination,' confided the mother. 'Will he say now that my children are not properly fed?'

'You need not worry about that. If they keep on as they are, they will be the best-nourished children in town, and they will be grateful to you all their lives for the gift of Health.'

Mrs. Ranganathan turned back as she was at the door.

'But, Doctor Amma, it was only by chance that my eyes were opened. Can not all women be taught these things from the beginning? If the mothers and mothers-in-law could learn what I have learned, what a difference there would be!'

SOURCE-BOOKS USED IN THIS CHAPTER

Richardson's *Rebuilding the Child*: A Study in Malnutrition. G. P. Putnam's Sons, N.Y., London, 1927; pp. 97–241.
Willard and Gilletts' *Dietetics for High Schools*, Chapter on Feeding the Child.

REVISION OF NUTRITION

PRACTICAL WORK

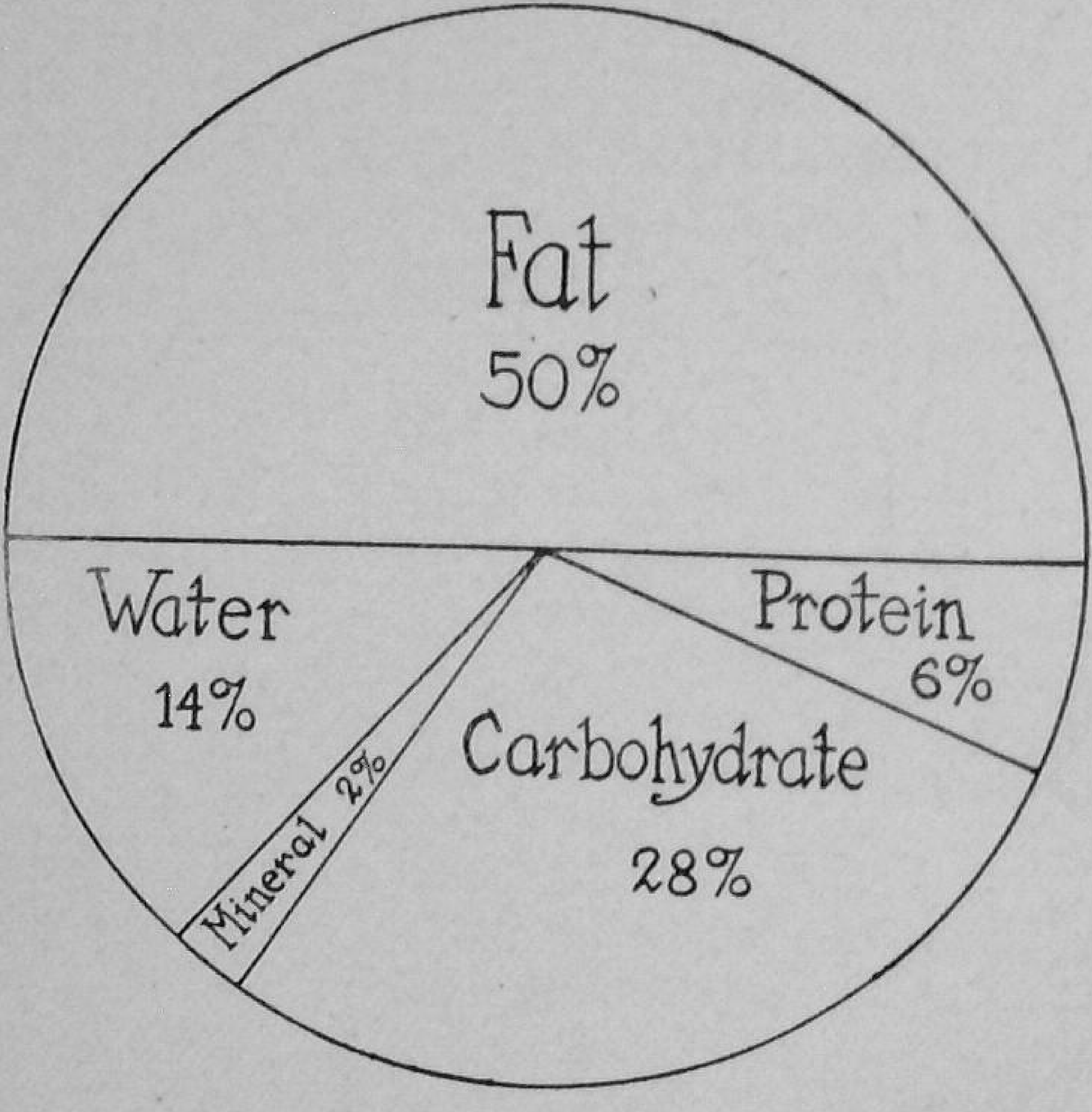


CHART SHOWING COMPOSITION OF COCOANUT

Make a set of charts like this to help you remember the proportion of different food elements in common foods.

Directions : Find the percentage composition in the table at the back of the book. Use compass and protractor. Remember that the sum of the angles at the centre is 360°. To represent 50 per cent Fat, measure an angle at the centre which is 50 per cent of 360°, and proceed in this way. Colour each sector a different shade, and keep the same colour-scheme throughout your series of charts. Any left-over sector may be marked ' Woody Fibre '.

PART II

Child Welfare

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HUSBAND AND WIFE

As a river loses itself when it blends with the ocean, so the bride becomes one with the family of her husband.

This is no mere marriage; it is the blending by love of their lives in one. And how can our words describe such a union?

Drenched by the billows of joy and sorrow in the ocean of life, this bond of love emerges, rendered indissoluble for evermore.

Ever on the hearts of husband and wife nectar is sprinkled; and by it the bond of joy and sorrow grows firmer, more divine, more lovely.

The relationship of husband and wife is full of love, yea, it is all pure love. The fragrant, cool wind of love fills their whole world.

Those are called husband and wife who have one soul, though their bodies and feelings be divided.

They are like two wheels in the cart of life; and vainly will one try to draw it without the help of the other.

Where this is not so, life is but wearisome. Apart from his wife, a husband is lame; and so is she apart from him.

When oil and wick combine, the flame leaps up; so, in the experience of the world, union alone is potent.

Lakshmi Bai Tilak, translated from Marathi.
(From *Poems by Indian Women*).

THE LIVING DOLL

Look, she is a living doll. As the fruit of a thousand births, as a reward for a thousand austerities, she had favour on us at break of day and came. To welcome her the dawn maiden with swift hands made blossom and bud to flower; when they heard that she would come to earth the sweet singing birds carolled welcome with dulcet voice; the morning breeze said softly to all men, 'There comes to earth a flower from heaven.'

Look, she is a living doll. Three months and six days ago she came to the dwelling of men; and even to-day she is weighed down with incessant sleep. She knows not day and night; tears, joy, love, laughter are all unknown; the maid is without consciousness, without error. Yet her own folk come running to her each moment like bees covetous of honey. When she bursts into laughter, all laugh too. What limitless power is in her little heart!

What a living doll she is! At the fragrance of her body all the world smiles; sephalika and bakul flowers shower down abashed. In her baby babble what music pours forth; in all the world where is its like? When rishis and sages see the moon of heaven shine upon her face, their hearts are moved within them.

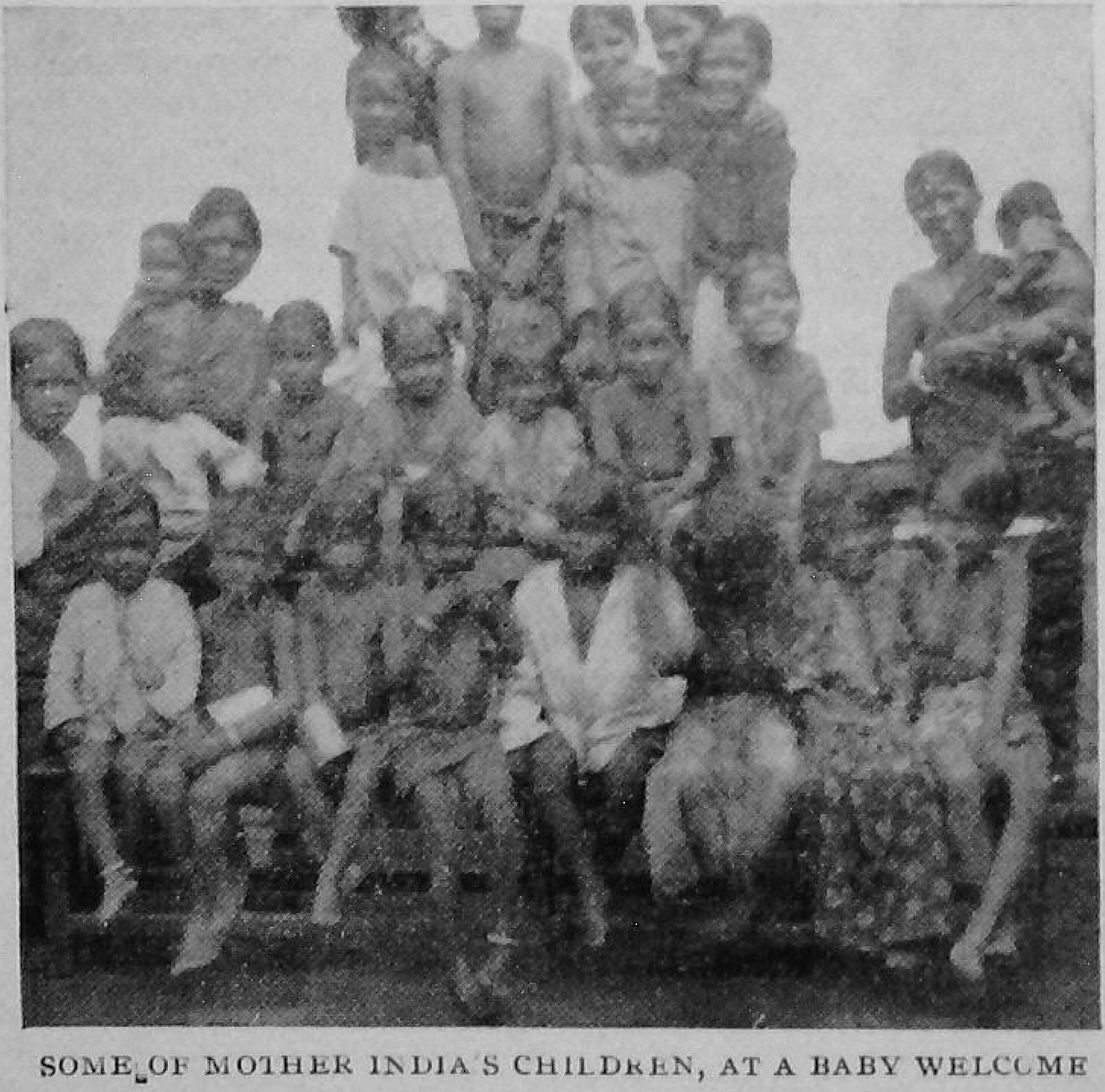
Look, she is a living doll. All day long with fascinated, unblinking eyes I look, yet the sting of unsatisfaction is within me. Love or joy she has taken away, poetry and memory too; she has snatched away my whole heart. Whenever I go anywhere, in a moment I come back and look. In truth she has made me a mechanical doll. Without her the world is empty; vice and virtue I forget. Blessed is thy power, and thy glory incomparable.

Pankajini Basu, translated from Bengali.
(From *Poems by Indian Women*)

INTRODUCTION

THE CHILD WELFARE MOVEMENT

Educated women can learn from books and from doctors about the care of their children, but educated women are only about two per cent of the women of India at present. What about the others? Are their children to be left to die? Millions of mothers have



SOME OF MOTHER INDIA'S CHILDREN, AT A BABY WELCOME

enough money to give their children proper food and care, but for lack of knowledge they waste the money on jewels

or on ceremonies which do the child no good and may do harm. Other millions have no money at all. Starving themselves, they cannot feed their children anything but the coarse grains or the toddy with which they keep themselves alive. No wonder the death-rate is high. The educated women, even though they be few in comparison, are setting themselves to the great task of saving India's babies. Unless everyone helps, their task will be very slow, but if each girl pledges herself in her school days to join in this Crusade, we may hope to see great changes in the next half century.

In Delhi we find established the 'Lady Chelmsford All-India League for Maternity and Child Welfare'. This League works among three lines:

i. The establishment of 'Health Schools' where nurses and midwives are trained to be Health Visitors, that is, to visit expectant mothers in their homes, advise them and teach them how to look after themselves, and get them to come to a Child Welfare Centre, where they may have medical attention and, if necessary, food. Important Health Schools are situated in Delhi, Calcutta, Lahore and Madras.

ii. The opening of Child Welfare Centres or 'Baby Welcomes', where mothers and babies can get needed help and where mothers can be taught.

iii. Propaganda work, that is, the spreading of information about the care of babies. This is done by the publication of books and pamphlets, the showing of cinema films, the arranging of meetings, lectures and exhibitions, and the holding of 'Health Week' celebrations all over the country.

More intimately connected with us is the 'Madras Presidency Maternity and Child Welfare Association',

which was organized in 1921 under the leadership of Lady Willingdon. This is connected with the All-India League, which assisted it, by means of grants, to embark upon various activities. Baby Welcome centres were opened in different parts of Madras, and in various towns in the mofussil, with the help of local subscriptions. In each of these centres there is a resident.

When we compare this state of affairs with conditions in England and America, we find that there the death-rate is slowly decreasing.[1] Some years ago a campaign in America had, as its slogan 'Save the seventh baby!' because the attention of the people was called to the fact that one child in seven had died the year before. As a result of increased efforts through such health-campaigns, child-welfare centres and education of the public, the lives of thousands of babies are being spared. Not only babies, but mothers too are saved by the newer knowledge of sanitation and hygiene. In London one mother dies for every 327 births, while in Madras one mother dies for every 60 births.[2]

Now let us inquire into the causes of this high death-rate among mothers and babies in India, in order that we may determine for ourselves whether these conditions are, as many say, 'the will of God', or due to man's ignorance of God's laws.

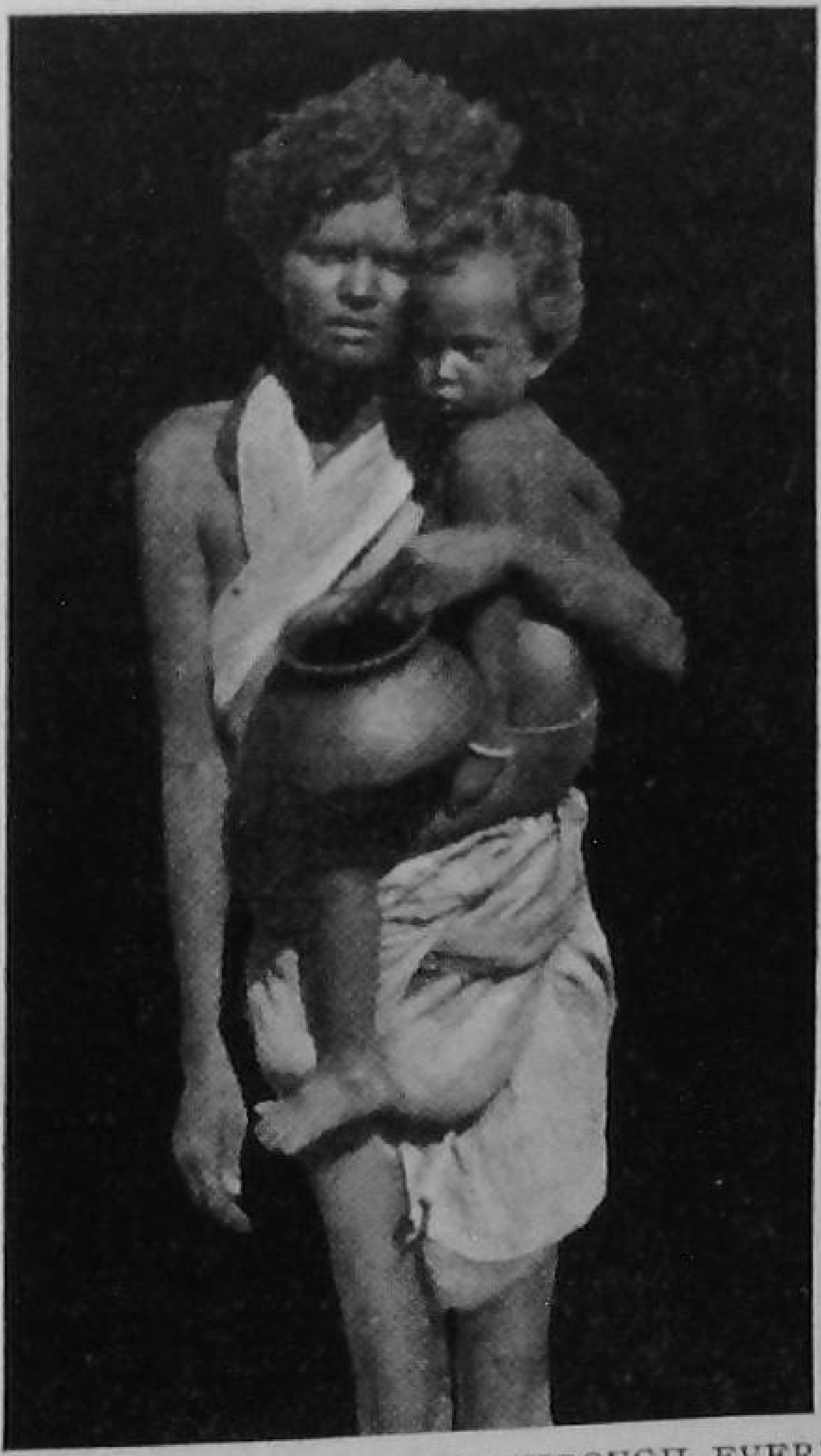
First in the list we must place Child Marriage. Because of this custom young girls are made to take up the burden of motherhood before they are fully developed or physically fit. Many babies are lost because of the immaturity of their mothers.

A second great cause is Ignorance. How few mothers in our land know anything about the cause and prevention

[1] *Maternity and Child Welfare*, by Dr. A. Lakshmanaswamy, p. 4.
[2] Ibid. p. 6.

of disease, prenatal care, infant feeding, or proper care of the child in the first years of life!

Then there are the various Infectious Diseases which attack both mother and baby,—diseases such as tetanus, pneumonia, dysentery, diarrhoea, malaria, which could be prevented if the mother had any knowledge of preventive medicine. Another disease which causes many deaths is syphilis, inherited by the baby from its mother. This could be cured before the baby's birth if the mother would go to the doctor.



'POVERTY . . . STALKS THROUGH EVERY VILLAGE OF OUR LAND'

Thousands of babies as well as mothers die because of wrong conditions at the time of birth. Instead of calling well-trained nurses or doctors or going to the hospital where proper care would be assured, the mothers suffer and die at the hands of superstitious and filthy barber-women who know nothing of cleanliness or hygiene.

Then there is Poverty, which stalks through every village and crowded city street of our land. Even if mothers know what to do for themselves and their babies, they cannot afford the nourishment and rest which they so sorely need. 'Poverty is never more hideous than when it assails the cradle and overshadows the child, blighting its whole life by its grim presence.'[1]

These are some of the enemies of India's babies, and who shall say that their depredations are allowed or determined by God of whom it was said, 'It is *not* the will of your Father that one of these little ones should perish.' Every educated woman and girl in India must join in a great crusade against these rakshasas which are bringing sorrow and blight into the homes of our people. As the heroes and heroines of old went forth with swords and lances to meet the foe, we must fit ourselves to fight with the two great weapons of Knowledge and Service. The following chapters will serve to set your feet on the path to knowledge and perhaps arouse within you a desire to become a 'servant of India'.

[1] *Maternity and Child Welfare*, by Dr. A. Lakshmanaswamy, p. 19.

CHAPTER I

MOTHER INDIA'S CHILDREN

During Health Week a number of lantern-lectures were held in the hall of Kamala's school, and the older girls were invited to bring their mothers to attend them. As Kamala was very anxious to go, Mrs. Ranganathan accompanied her, and took also her eldest daughter, Padma, who had returned home for a long visit before the birth of her first child. All three were so interested in the lectures that they returned night after night until the series was complete. Some of the talks were especially interesting to young girls like Kamala who were always thinking about their future, and others were valuable to the young wife, Padma, who was expecting her first child, and to her mother, who was anxious that her daughter should avoid her own mistakes. These were the lectures:

THE FIRST LECTURE: MOTHER INDIA'S CHILDREN

Infant Mortality

Those of us who are interested in the future of India and want to have a share in making it a strong nation, must remember that the health of any nation is dependent upon the health of its children. The degree of health which a nation has attained is indicated by the number of deaths in a year. In reading the statistics of Infant Mortality we find that India heads the list in the number of babies that die each year. Starting from Ireland and

travelling east and south there is a gradual rise in the infant death-rate until we reach India where probably one-fifth of those born die during the first year of life.

In 1923 in England sixty-nine out of every thousand babies died, while in Calcutta in that same year two hundred and eighty-seven babies died out of every thousand. In 1926 in the Madras Presidency the death-rate was 185·5,

TEN BABIES
Must two die out of every ten?

—nearly two out of every ten babies. Of these nearly half died during the first month of life. In some cities in Madras Presidency the rate has gone as high as four out of every ten babies in certain years. What a waste of precious life! It has been stated 'that somewhere in this Presidency an infant is dying every two minutes all through the year!' How many, then, have died since you got up this morning, or even since we began this subject?

Perhaps you have visited the Baby Welcome in your

town early in the morning when the poor mothers bring their babies in to be bathed and fed. Sometimes a visiting doctor is there to examine the mothers and their babies, and give prescriptions or treatment or advice. Some mothers are fed with milk and ragi-conjee as well as the babies, and sometimes with this extra nourishment they are able to nurse their babies again. Mothers who have to work all day are urged to leave the babies at the centre in charge of the nurse, and there they sleep in cleanliness and quiet, with milk at regular intervals, instead of being lugged about in the burning sun. In 1928 there were eleven such centres in Madras and fifty-three in the mofussil. The expenses of such a centre are met by subscriptions in the town and by grant of the Central organization which sends around officers to inspect and advise the nurses. In each town, a committee of ladies takes the responsibility of raising money and supervising the work of the centre. Many Indian ladies give hours of their time and much of their money in this work for their poorer sisters. It takes a large heart and a spirit of unselfish and patriotic service, to look beyond the narrow domestic walls of one's own home and one's own family and take an interest in others.

These Baby Welcomes meet the needs chiefly of the poor. What of the equally ignorant mothers of the better classes who do not need money-help, but do need education about bringing up their children? Thousands of these are in purdah, and other thousands are afraid of doctors and hospitals. Propaganda work, especially during Health Week, by means of lantern-lectures, films, exhibitions and baby shows, is being promoted by many municipalities. It is hoped that through these, women may at least come to feel that doctors and nurses are their

friends, not enemies, but progress is very slow. Government is trying to train to a higher standard of cleanliness and efficiency some of the barber midwives whom the people will trust, as well as placing well-trained midwives in each municipality. Schools are beginning to realise the importance of teaching girls about these matters, but in the mofussil only a very few girls study as far as the classes where they might be given such information. Women who realise that doctors are their friends, are given help and advice at women's hospitals. But with all these efforts the tremendous task is barely begun. Only the outmost fringe of people come within the range of these activities. Think of the millions in side streets and alleys of cities and towns, and in the myriad villages, who still know nothing but the old customs, who love their babies dearly but cannot save them by all their charms and brandings and offerings and tears. Notice as you walk through the streets, how many babies are thin, puny, scrawny or deformed or blind. Ask mothers how many children they have borne, and how many are now alive. Go into the dispensaries and hospitals and see the little girls whose health is ruined by too early motherhood. In all these ways you can make the statistics seem real facts and not just a jumble of numbers and words.

India needs a whole army of workers to attack this great problem. Children are always largely the business of women, so it is the women who must meet their need. Girls who have had some High School education can take three years' training in nursing and midwifery, and then a year at the Health School in Madras. They can then be in charge of a Baby Welfare centre, and organize the Baby Welfare activities of a whole town. They can be nurses or Health Visitors connected with a centre. As teachers

they can teach Mothercraft to girls who will some day be mothers. Married women who have children of their own can, by the way they bring up their own children, be an object-lesson to their neighbours. This is the most effective way of influencing others. They can visit a Baby Welcome helping the nurse. They can contribute money to this work, and serve on committees which are working to promote it.

If every girl who hears these words will begin at once to take an interest in the nearest Baby Welcome, and work toward one of the above goals, her influence will win many others to work for the children of Mother India.

'*Usefulness is the rent we pay to God for room on earth.*'

SOURCE-BOOKS USED IN THIS CHAPTER

Maternity and Child Welfare, by Dr. A. Lakshmanaswamy Mudaliar.

Report of Madras Maternity and Child Welfare Association, 1928.

CHAPTER II

THE SECOND LECTURE: THE BEGINNING OF LIFE

Motherhood as a Profession

In these modern days women talk a great deal about the professions which are opening to them—teaching, nursing, medicine and even law. Any one of these professions requires a long and severe course of preparation. We should not give our lives into the hands of a doctor who has not completed ten or more years of hard, scientific study of the human body, nor should we engage a lawyer to defend our rights were we not convinced of his ability to meet any emergency. And yet, how many thousands of women enter the most important profession in the world—that of motherhood, totally untrained and unprepared. 'Oh, that is a matter of instinct!' say some, believing that with the baby will be born full knowledge of how to rear it. Mother-birds or mother-cats may have such unerring instincts but human mothers have intelligence with which they can learn the laws of body and mind and be guided by the accumulated wisdom and knowledge of the ages. It is not safe to trust the advice of ignorant grandmothers who are ruled by custom rather than wisdom. While some customs are doubtless good, many have proved dangerous and fatal, as the statistics already quoted have proved. Every woman, whether she is to bring up her own children or the children of others, should learn the truth, so far as men have been able to discover it, regarding the laws that govern the body, and then try to put into practice the laws that she has learned.

The Beginning of Life

One of the greatest laws of Nature is Reproduction. When a tree dies, it leaves behind it countless other trees of its own kind to take its place. Were it not for this law, the earth would soon be empty of all plant and animal life. We have learned in Botany that the organ of reproduction in the higher plants is the flower. A grain of pollen from the stamens, passing down through the long style of the ovary, fertilizes one of the tiny eggs. If we planted the grain of pollen alone, it would not grow, nor has the egg any capacity for growth. But when the two join in one, a marvellous change occurs. The seed is formed which, when planted under right conditions, will grow into a new plant. By much the same principle the higher animals and man reproduce their kind. On either side of a woman's pelvic cavity is a small ovary filled with egg-cells which alone have no power of growth. It is thought that one egg-cell passes out each month through the Fallopian tubes into a muscular pear-shaped bag called the *uterus* and then out of the body through the passage called the *vagina*. After these organs are complete, in about the twelfth or fourteenth year the girl matures,—that is the menstrual flow from the uterus begins. But until she is eighteen or twenty her body is not fully developed nor her growth complete, nor is she of sufficiently mature mind to undertake the responsibilities of a wife and mother.

When she is ready in body, mind and character for this great responsibility, she may be married—that is, she may enter upon a life-long partnership with a man who should be her equal in strength and purity of mind and body, and should share her ideals and be in sympathy with her views of life. When two such kindred spirits unite to

form a home and rear a family, their union is not only physical but spiritual. As a result of their physical union a sperm-cell from the father joins with an egg-cell in the uterus of the mother, and this forms the seed of a new life. As a result of their spiritual union, the father loves and cherishes the mother, helps and protects and supports her through her days of weakness and suffering. Each lives for the other, and both live for their children.

As soon as the seed of the new life is formed, it begins to grow with amazing rapidity. You may have seen an amoeba, or single-celled creature, if you have examined a drop of dirty water under a high-power microscope. The human seed is first a single cell like the amoeba, composed of nucleus and protoplasm. The one cell becomes two. The two cells divide into four, the four into sixteen, the sixteen into two hundred fifty-six and so on. These cells become differentiated into bone-cells, muscle-cells and all the other kinds of tissues about which you have learned in Physiology, and so the human embryo develops. For nine long months this embryo is kept safely within the body of the mother, in the muscular bag called the uterus. The mother's blood carries to her child the nourishment and oxygen which the growing tissues need, and carries away the waste-matter. The mother must eat and breathe and live for her child. As an English poet says in a beautiful tribute to his mother:

'Through all the months of human birth
Her beauty fed my common earth;
I cannot live nor breathe nor stir
But through the death of some of her.'[1]

[1] John Masefield, '*C.L.M.*'

The mother has nine months of waiting, in which to prepare for her child. During these months she has time to sew the clothes which her baby will need, to make ready its whole outfit of bedding, towels, frocks, and warm wraps. She can find out through books and from her doctor all that a mother needs to know about the care and feeding of the baby at different ages. She can learn something, too, of the child's development in mind and character, so that she may avoid making blunders in training him from the beginning. She must be prepared to do the great work which will begin when her child is born, and to this end she will pray that God may give her strength and wisdom to train the child aright. But besides this preparation for the future, there is much that she can do to help the growth of the baby by proper care of herself during the time of waiting.

Note: For more detailed study of 'The Beginning of Life' both teachers and pupils are referred to the following books which should be in the school library:

For Girls and the Mothers of Girls by Dr. Hood: Bobbs-Merrill Co., U.S.A., obtainable at Higginbotham & Co., Madras.
Growing Up by Karl de Schweinitz: Macmillan & Co., U.S.A.
The Way Life Begins by Cady, obtainable at Y. M. C. A. Publishing House, Calcutta.
A Clean Heart or *Lessons on Motherhood* by Mrs. West: C.L.S., Madras.

PRE-NATAL CARE

It used to be said that the foundation for the health of a child was laid during the first year of life. Now we know that we must go further back than this, to the period before its birth. By experiments upon animals we have found out that the care of the mother during pregnancy has a large influence upon the offspring, the diet being of special importance. Every baby has the right to be born healthy and the mother can do many things to

make him strong. A little care during pregnancy and a knowledge of the earliest signs of trouble will often save the life of the mother and child.

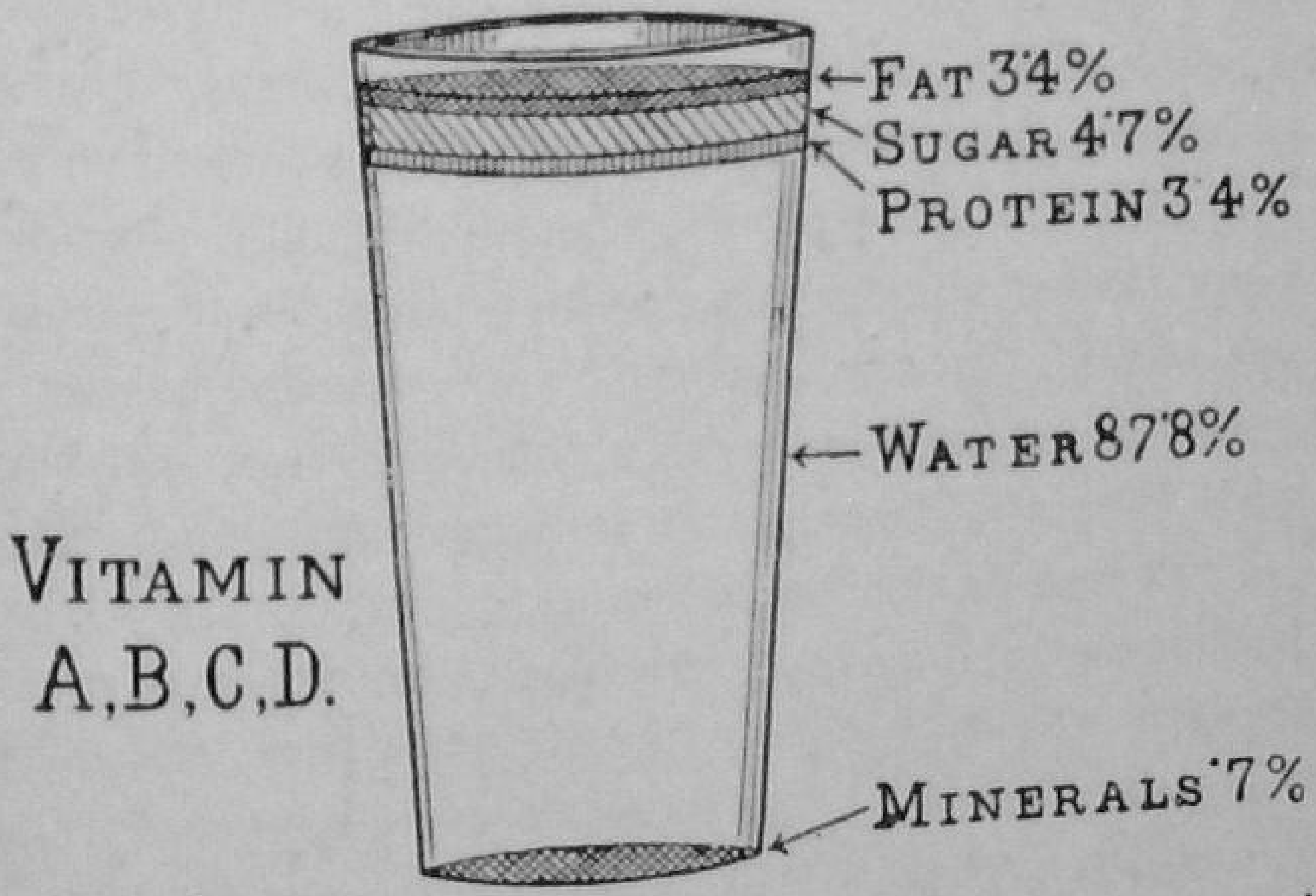
WHAT TO DO

As soon as a woman knows that she is to become a mother, she should place herself under the care of a doctor. If she cannot afford a private attendant she should go to a doctor at the nearest hospital or dispensary. Some hospitals hold weekly pre-natal clinics for expectant mothers. At this time she should lead a quiet life with an extra amount of rest in the day-time. She should have plenty of fresh air both day and night, and much sunshine. Sunshine is essential for it supplies to both mother and child Vitamin D without which they cannot become strong. Moderate exercise, such as walking and light house work are desirable, but heavy lifting and over fatigue should be avoided. It is especially important that an expectant mother should rest as much as possible during the week when her monthly period would occur were she not pregnant, for it is at this time that miscarriage (premature birth of the child) is most likely to occur. If she is working for her living, it is advisable that she stop at least two months before the baby is expected. To continue heavy work until baby arrives may do harm.

Bathing every day is necessary. The pores of the skin should be kept open as some of the poisons of the body are thrown off in this way. A mild soap will help to get rid of the grease which stops up the pores. Vigorous rubbing at the time of the bath improves the circulation and gives a sense of well-being. If the skin is not doing its share of excretion, extra work is put upon the kidneys, and trouble may result.

Her clothing should be light in weight and loose, with no tight bands around the waist. Her teeth should be kept scrupulously clean. She should take care not to break the mucous membrane of her mouth with pieces of charcoal, for a break opens the way for germs to enter and cause infection. Her bowels should be emptied at least once a day. If she is constipated she should overcome the condition by diet and exercise, or consult her doctor if these are of no avail.

Diet is the most important matter for the health of mother and child. A wrong diet affects the development of the baby. Not only should the mother eat enough food to nourish herself and the baby, but the food should be of the right kind, that is it must contain the proper elements for the building of muscles, bones, teeth, blood, and other parts of the body. It must contain calcium and



MILK, THE NECESSITY FOR MOTHERS AND CHILDREN
A Diagram illustrating the Composition of Milk.

phosphorous for bone and teeth formation, protein for muscles, fat for padding, sodium salts and iron for the

blood. It must contain, also, all the vitamins or body-builders, which are accessory to growth and development. *Milk*, whether of cows, buffaloes or goats, is a necessity not only for its nourishing qualities, but because it contains a great deal of calcium and Vitamin A. *Vegetables*, especially the green leafy varieties, contain many of the necessary minerals such as calcium, sodium and chlorine, They also prevent the blood from becoming acid by balancing the acid-producing tendencies of meat and cereals. They are a source of Vitamin A, B, and C, and they help to prevent constipation. The root vegetables, such as potatoes, are rich in carbohydrates and contain some minerals. *Fruit* should be eaten plentifully, especially oranges and tomatoes. Meat should be eaten sparingly. Of cereals *ragi* and *wheat* are of most value, and should be eaten at least once a day. Six tumblers or chembus of *water* should be drunk every day to help throw off the body poisons.

The expectant mother suffers at times from 'morning sickness', or nausea. It will give relief sometimes if she eats a biscuit or a piece of dry toast before she rises in the morning. When she feels sick she should lie down to prevent vomiting. It she suffers from varicose veins, they should be given support with a bandage, and she should avoid too much standing. It is very important that she cultivate a cheerful habit of mind, for anger or brooding may harm her health. 'A cheerful heart doeth good like a medicine.'

Danger Signals

If the mother observes any of the following symptoms, she should realize that they are signals of something wrong and go immediately to her doctor:

1. Persistent vomiting.

2. Persistent headache, spots before the e ness, swelling of the feet. There is a general swelling of the feet, ankles and face is natur time. It is often the first sign of kidney and hea and the doctor will want to examine the urine.

Even if there is no swelling, the urine should ined once a month for the first month, and once during the last two months.

3. Any discharge from the vagina especially bloody. The common signs of miscarriage are bleeding. If this occurs the mother should go to once and send for the doctor.

4. Failure to feel life—that is, to feel the baby after once it has been felt.

If these, or any other unusual developments are r to the doctor promptly, much trouble may be prevent

WHAT SHE SHOULD PREPARE

The prospective mother should prepare certain for the coming event. The amount and kind of ment would naturally depend upon the financial con of the family, and upon whether the baby is to be at home or in the hospital. The ideal thing is fo mother to go to the hospital where she can have the care with the least amount of effort on her part.

If the confinement is to be at home, the sunniest lightest room should be chosen. There should be a t and several chairs in the room if possible. The bed sh be firm and not too low. There should be a piece of cloth to protect it, or else a protector can be made newspapers covered with old linen or freshly-washed t *kora* firmly stitched on both sides. This can be bur after use.

s to keep on hand for the confinement are:
an sheets, towels and pillow-slips.
an white clothing for the patient.
o basins.
ap.
and brush.
osorbent cotton in sterile packages.
heap cloth or any old linen, freshly washed, to make into pads and napkins.
lenty of hot and cold water.

THE BABY'S OUTFIT

baby's needs are few and everything should be as as possible. The following list can be modified ng to the mother's ability.

Blanket to receive the baby when it is born.

Some small pieces of clean soft cloth, four inches square, for the cord.

Some bands of soft cloth, preferably flannel, eighteen inches long and five inches wide, to wrap around the baby's abdomen to keep the dressing in place.

Boric powder to dress the cord.

One or two dozen napkins or diapers, made of soft cloth, made square to be folded into a triangle. The square should be from a half to three quarters of a yard. If the baby is small it may have to be folded twice.

6. Baby slips or frocks, made simply of soft washable material. Some should be of flannel for damp days.
7. A few squares of soft cloth for washing the baby.
8. Soft towels for drying the baby.

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